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(54) **Device for connecting a tool to a driving means of a working machine**

(57) Device for connecting a tool (T) to a driving means (A) of a working machine; said device comprising a first member (2) and a second member (3), fit to be fixed to the tool (T) and to the driving means (A), and provided with hooking means (4,5) for the mutual removable hooking; one of said members (3,2) being furthermore provided with at least a bolt means (6) fixed to a moving means (9) sliding in this latter member (3,2) between an internal condition and an external condition of the at least one bolt means (6) in which this latter can engage, in a hooking and approaching condition between the members (2,3), at least a seat (7) of a matching means (8) of the other member (2,3) to carry out, cooperating with the hooking means (4,5), the connecting condition (C) between the tool and the driving means; the device (1) comprising furthermore elastic means (11) acting on the moving means (9) in direction of the external condition of the at least one bolt means (6) and one blocking means of (10) fit to carry out a removable stop condition of the moving means (9) at least in the internal condition

Said device (1) comprises a mobile feeler means (12), associated to one of the members (3,2), turned toward the matching means (8) at least in conditions next to the approaching condition, and acting on the blocking means (10); said feeler means (12) being driven, at least in proximity of the condition of the approaching condition of the members, from its matching with the matching means (8) to act on the blocking means (10) to unblock the moving means (9) allowing the elastic means (11) to translate said moving mean (9) and the at least one bolt means (6) engaging this latter in the at least one seat (7) carrying out the connecting condition (C).

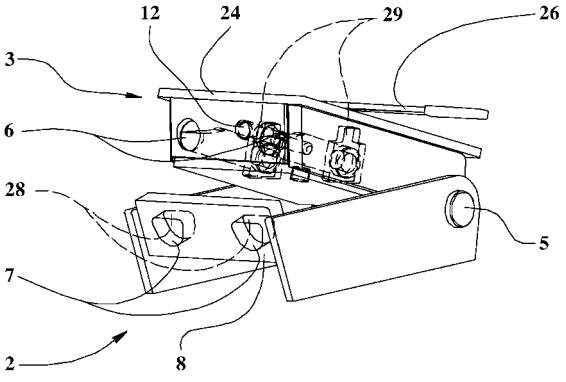


FIG.2

EP 1 900 880 A2

Description

[0001] The present invention relates to the technical field of the mechanical connections and it refers to a device for connecting a tool to a driving means such as an articulated arm of moving means for moving the ground, for demolition or for housebreaking, for agricultural means or for the green maintenance and the like, in general for mechanically connecting mechanical elements of various natures in a detachable manner.

[0002] There are known devices fit to connect removable tools, such as buckets and percussion hammers for demolition having operating supports, such as articulated arms of self-moving machine for moving ground, for demolition or the like.

[0003] Said known devices are provided with a first member blocked to the tool and with a second member blocked to the operating support. In general, a side of a member is provided with a transversal pivot for hooks of the corresponding side of the other member. Therefore, it is possible to couple and to uncoup le the hooks of a member to the pivot of the other.

[0004] In the coupled condition, the two members can mutually rotate as a pivot swivelling connection To block such rotation, preventing the uncoupling and realizing the connection between the members, one of them is equipped with a bolt sliding between an inner condition and a protruding condition in which it can engage itself in a respective seat carried out in the another member.

[0005] A disadvantage of said known devices consists in that they require manual operations made by an operator for every activation of the bolt which causes waste of time and risks for the operator.

[0006] Other disadvantages of said devices consist in that they have excessive gaps, undergone excessive stresses with risks to be broken and they do not provide sufficient reliability and safety.

[0007] Some known devices are equipped with blocks and safety catches but they have the drawback of being not reliable and subjected to malfunction due to their own complexity.

[0008] An object of the present invention is to provide a device for connecting a tool to a driving means able to carry out automatically the mutual block when they are put in the connection position.

[0009] Other object is to propose a device almost gap free and very resistant against stresses.

[0010] Further object is to propose a simple and reliable device able to provide very safe connection

[0011] Other object is to propose a device which allows to uncouple the tool also in case of damages of the organs for the opening.

[0012] Further object is to propose a device able to couple the tool to the driving means with opposite orientations.

[0013] The characteristics of the invention are highlighted in the following with particular reference to the enclosed drawings, in which:

- Figure 1 illustrates a side and schematic view of the device of the present invention associated to a tool and to a driving means in a connecting condition;
- Figure 2 illustrates a axonometric view of the device of figure 1 partially coupled;
- Figures from 3 to 5 illustrate respectively front view, the top view and the sectional view of the device of figure 2;
- Figures 6 and 7 illustrate respectively axonometric view and front view of the device of figure 1 in the coupled condition;
- Figures 8 and 9 illustrate sectional view according to planes VIII - VIII and IX - IX of figure 7;
- Figure 10 illustrates a top view of a first variant of the device of figure 1;
- Figure 11 illustrates a front view of a second variant of the device of figure 1 in the coupled condition;
- Figures 12 and 13 illustrate a sectional view according to the planes XII - XII and XIII - XIII of figure 11;
- Figures 14 and 15 illustrate axonometric views of the variant of figure 11 of the device respectively in partially coupled and coupled conditions;
- Figure 16 illustrates a front view of o a third variant of the device of figure 1 in the coupled condition;
- Figure 17 illustrates a sectional view according to the plane XVII - XVII of figure 16;
- Figure 18 illustrates a sectional view of a first member of figure 17;
- Figure 19 illustrates a axonometric view of the first member of figure 16;
- Figure 20 illustrates a axonometric view of the device of figure 16 in a partially coupled condition.

[0014] With reference to the figures from 1 to 9, numeral 1 indicates the device, object of present the invention, for connecting a tool T to a driving means A.

[0015] Said device 1 comprises two members, first 2 and second 3, fit to be fixed with the tool T and to the driving means A, for example by means of welding.

[0016] Said members are equipped with respective hooking means 4, 5, of known type, for the mutual removable coupling.

[0017] A side of the first member 2 has a transversal pivot for lateral hooks of the second member 3. In a mutual approaching and angled condition between the members, the transversal pivot is inserted into the hooks through their openings. The successive rotation between the members around the transversal pivot, reducing the angle value formed between them down to zero, allows to approach them up to an approaching condition in which they are almost side-by-side and approached to each other.

[0018] The second member 3 is furthermore provided with two bolt means 6 fixed to a moving means 9 sliding into the second member 3 between an internal condition and an external condition of the bolt means 6 in which these latter protrude from the second member and, in the approaching condition, can engage respective con-

cave seats 7 carried out in a matching mean 8 of the first member 2 to carry out, by cooperating with the hooking mean 4, 5, the connecting condition C between tool and the driving means. The bolt means 6 are housed, in freely sliding manner, in respective tubular housing 33 fixed to the second member.

[0019] In alternative, the invention provides that the bolt means and the organs connected thereto are associated to the first member, and the seats 7 are associated to the second member.

[0020] The device 1 furthermore comprises elastic means 11 acting on the moving means 9 in direction of the external condition of the bolt means 6 and a blocking means 10 fit to carry out a removable blocking condition of the moving means 9 in the internal condition preventing the elastic means to put the bolt means 6 in the external condition.

[0021] The device 1 comprises a mobile feeler means 12, associated to the second member 3 in such manner that it can translate axially in a direction oriented, in the conditions next to the approaching condition, towards the matching means 8 and acting on the blocking means 10.

[0022] The feeler means 12 near to the approaching condition, is driven by its own match with the matching means 8 to act on the blocking means 10 for unblock the moving means 9 allowing the elastic means 11 to translate said moving means 9 and the bolt means 6 engaging them in respective seats 7 to carry out the connecting condition C.

[0023] The matching means 8, in which are carried out the seats 7, is fixed to the first member 2, for example by means of welding or being carried out integral thereby, and therefore it is fit to fixed to the tool.

[0024] The bolt means 6 and the respective moving means 9, the elastic means 11, the blocking means 10 and the mobile feeler means 12 are associated to the second member 3 and therefore they are connected to the driving means.

[0025] The feeler means 12, for example of cylindrical shape, translates in a respective guide 13, for example of cylindrical tubular shape, fixed to the second member 3 in almost parallel direction in respect to the sliding direction of the bolt means 6.

[0026] The match means 8, for example carried out starting from a steel plate, has a matching surface 14, fit to slidingly match with the external end 20 of the feeler means 12. Said matching surface is of almost flat shaped and is inclined in respect to the translation direction of the feeler means 12 in proximity of the connecting condition C.

[0027] For example, in the connecting condition, the sliding axis of the feeler means 12 can form with the matching surface 14 a right angle or, preferably an obtuse angle.

[0028] Said inclination cause the translation toward the internal condition of feeler means 12 in corresponding to the approach of this latter to the connecting condition C.

[0029] The device comprises a pivot 22 connected, in freely rotating manner around its own axis, to the second member 3. Said axis of the pivot is perpendicular to the sliding plane of the bolt means.

[0030] The blocking means 10 is rigidly connected to the pivot 22 forming therewith an almost right angle in order to rotate on a plane parallel to the sliding plane of the bolt means 6.

[0031] The moving means 9 is provided with a shaped cavity 16 for housing the blocking means 10 which rotates around the pivot 22 between two extreme blocking conditions of the moving means 9 in which the bolt means 6 are respectively in the internal and external conditions.

[0032] Said pivot 22 has also, rigidly fixed thereto, an arm means 15 fit to match with the internal end 21 of the feeler means 12 during the translation of this latter towards the internal condition to cause the rotation of the blocking means and therefore to unblock the moving means 9.

[0033] The blocking means 10 is elongated shaped, with the end opposite to the end fixed to the pivot 22 having a hook shaped portion 18 to prevent the moving means 9 sliding toward the inside of the device 1 matching a shaped protrusion 17 of the cavity 16.

[0034] The end opposite to the end fixed on the pivot 22 of the blocking means 10 is also provided with a first flat portion 19 to prevent the moving means 9 sliding toward the external of the device 1 matching a corresponding second flat portion 23 of the cavity 16.

[0035] An end of pivot 22 protrudes from the upper face 24 of the second member 3, fit to being turned toward the driving means A, and has a coupling 25, for example with hexagonal head or the like, for a tool 26, for example a hexagonal spanner, for rotating the pivot 22 and driving the blocking means 10.

[0036] The two bolt means 6 are of elongated shape, approximately prismatic or cylindrical, they are mutually parallel and they are fixed to the moving means 9, having a form of a shaped plate, by means of respective bracket coupling means 29. The two seats 7 of the matching means 8 have the dimensions suitable to house the external ends of the bolt means 6.

[0037] The upper portions, fit to face the driving means A, of the external ends of the bolt means 6 have respective inclined planes 27 fit to match corresponding flat portions 28 of the seats 7.

[0038] In the connecting condition C, each inclined plane 27 is parallel with and matches the corresponding flat portion 28.

[0039] The elastic means 11 comprise one compressed helicoidal spring for each bolt means 6.

[0040] The helicoidal springs are partially housed in cavity of the bolt means 6 or of the respective coupling means 29.

[0041] The blocking means 10 undergoes the action of the spring means 30 acting thereon in direction of the external condition.

[0042] The operation of the device, starting fom an internal blocking condition of the bolt means carried out by

the matching of the first flat portion 19 of the blocking means 10 with the corresponding second flat portion 23 of the cavity 16 carried out in the moving means 9 and from a condition in which the hooking means are engaged, it provides that the mutual rotation of the members 2, 3 toward the approaching condition provokes the sliding matching of the feeler means 12 with the matching surface 14 causing the translation toward the inside of the feeler means. This latter translation causes, first of all, the contact of the feeler means against the arm means 15 and, subsequently, the rotation of this latter and of the blocking means which unblocks the moving means allowing the elastic means to push the bolt means into the respective seats so realizing the condition of connection C.

[0043] Obviously, it is possible to put the bolt means in the external condition acting also on the coupling 25 by means of the rotation tool 26.

[0044] In the connecting condition C, eventual forces acting on the bolt means in internal direction, or in other words, tending to make it coming out from the seats, with such intensity to translate the moving means 9 toward the outside seats, said forces cause the hooking of the shaped protrusion 17 of the moving means with the hook-shaped portion 18 of the blocking means 10 avoiding further translations of the moving means and avoiding the undesired outgo of bolt means from the respective seats.

[0045] The uncoupling can be carried out by acting the tool 26 on the coupling 25 to rotate the blocking means toward the inside. Said rotation causes the blocking means, acting on the edge of the cavity 16, translate the moving means 9 toward the inside taking away the bolt means from the respective seats. The uncoupling is completed by rotating the members and separating the hooking means 4, 5.

[0046] In the first variant of the device of figure 10, the upper face 24 of the second member has an accessing window 31 to access the hook-shaped portion 18 of the blocking means 10 and on the shaped protrusion 17 of the cavity 16. Said window allows to act directly on the said elements to uncouple the device even if in case the coupling 25 or the pivot 22 is broken.

[0047] In this variant, a nameplate 32 with operational indications is removably fixed on the upper face 24 of the second member, occluding the window 31 in the normal operational conditions.

[0048] The device of the second variant of figures from 11 to 15 differs from the first embodiment in that the edge of the matching means 8 turned toward the tool has a concavity that defines only an unique elongated seat 7 for the external ends of the corresponding bolt means 6.

[0049] The device of third variant of figures from 16 to 20 comprises a pair of hooks 4 of the hooking means fixed laterally to an end of the second member 3.

[0050] Each front end and rear end of the first member 2 has a respective transversal pivot 5. One of said transversal pivots 5 is removably engaged to the hooks 4 while the other transversal pivot carries out the matching means 8 of the seat 7 for the bolt means 6 and vice versa. In such manner, the mutual coupling of the first 2 and second 3 members with opposite orientation is possible. For example, in case of bucket tool, with the concavity turned toward the vehicle having the articulated arm driving means, as in the common use, or on the contrary, with the convexity of the bucket toward aid vehicle.

[0051] The two transversal pivots 5 are of cylindrical shape, with axis perpendicular to the orientation of the bolt means 6. The matching surface 14, for the external end 20 of the feeler means 12, is constituted by a flattened surface carried out, for example by means of milling, on the surface of said pivots 5.

[0052] Each transversal pivot 5 has one or more respective flattened surfaces in order to carry out the flat portion 28 for the inclined planes 27 to the bolt means 6.

[0053] A further variant, which can be understood without specific drawing, provides that the arm means 15 is connected to a mobile end of a linear actuator connected to the second member 3 and fit to drive the blocking means 10 to allow at least the uncoupling without the manual operations.

[0054] An advantage of the present invention is provide a device to connect a tool to a driving means able to carry out automatically the mutual block when they are put in the connecting position.

[0055] Other advantage is to provide a device almost without gap and very resistance against the stresses.

[0056] Further advantage is to provide a simple and reliable device able to provide a very safe connection

[0057] Other advantage is to provide a device which allows to uncouple the tool also in case the organs for uncoupling are damaged.

[0058] Further advantage is to provide a device able to allow the coupling of the tool to the driving means with opposite orientation

Claims

1. Device for connecting a tool (T) to a driving means (A); said device comprising a first member (2) and a second member (3), fit to be fixed to the tool (T) and to the driving means (A), and provided with hooking means (4, 5) for the mutual removable hooking; one of said members (3, 2) being furthermore provided with at least a bolt means (6) fixed to a moving means (9) sliding in this latter member (3, 2) between an internal condition and an external condition of the at least one bolt means (6) in which this latter can engage, in a hooking and approaching condition between the members (2, 3), at least a seat (7) of a matching means (8) of the other member (2, 3) to carry out, cooperating with the hooking means (4, 5), the connecting condition (C) between the tool and the driving means; the device (1) comprising furthermore elastic means (11) acting on the moving means

(9) in direction of the external condition of the at least one bolt means (6) and one blocking means of (10) fit to carry out a removable stop condition of the moving means (9) at least in the internal condition; said device (1) being **characterized in that** it comprises a mobile feeler means (12), associated to one of the members (3, 2), turned toward the matching means (8) at least in conditions next to the approaching condition, and acting on the blocking means (10); said feeler means (12) being driven, at least in proximity of the condition of the approaching condition of the members, from its matching with the matching means (8) to act on the blocking means (10) to unblock the moving means (9) allowing the elastic means (11) to translate said moving mean (9) and the at least one bolt means (6) engaging this latter in the at least one seat (7) carrying out the connecting condition (C).

2. Device according to claim 1 **characterized in that** the matching means (8), in which the at least one seat (7) is carried out, is fixed to the first member (2) fit to be fixed to the tool; the bolt means (6) and the respective moving mean (9), the elastic means (11), the blocking means (10) and the mobile feeler means (12) are associate to the second member (3).

3. Device according to claim 1 **characterized in that** the feeler mean (12) translates in a respective guide (13) fixed to the second member (3) in direction almost parallel to the sliding direction of the at least a bolt means (6).

4. Device according to claim 1 **characterized in that** the matching means (8) has a matching surface (14), fit to match slidingly the external end (20) of the feeler mean (12), and having shape almost flat and inclined respect to the translation direction of the feeler means (12) in proximity of the connecting condition (C), said inclination causing the translation toward the internal condition of the feeler mean (12) corresponding to the approaching of this latter in the connecting condition (C).

5. Device according to claim 1 **characterized in that** the blocking means (10) is rigidly connected to an arm means (15) fit to match with the internal end (21) of the feeler mean (12) during the translation of this latter one toward the internal condition to unblock the moving means (9).

6. Device according to claim 1 **characterized in that** the moving means (9) is provided with a shaped cavity (16) for the blocking means (10) which is connected in rotating manner, by means of a pivot (22), to the second member (3) and rotating between two extreme blocking conditions of the moving means (9) with the at least one bolt mean (6) in the internal and external conditions.

7. Device according to claims 5 and 6 **characterized in that** the arm mean (15) is fixed to the pivot (22) of the blocking means (10).

8. Device according to claim 6 **characterized in that** the blocking means (10) is of elongate shaped, with the end opposite to the end fixed to the pivot (22) equipped with a hook-shaped portion (18) to avoid the moving means (9) to slide toward the inside of the device (1) matching one shaped protrusion (17) of the cavity (16).

9. Device according to claim 6 **characterized in that** the blocking mean (10) is elongated shaped, with the end opposite to the end fixed to the pivot (22) equipped with a first flat portion (19) to avoid the moving means (9) to slide toward the outside of the device (1) matching a corresponding second flat portion (23) of the cavity (16).

10. Device according to claim 6 **characterized in that** an end of the pivot (22) protrudes from the upper face (24) of the second member (3), fit to be oriented toward the driving means (A), and has a coupling (25) for a tool (26) for rotating the pivot (22) and for driving the blocking means (10).

11. Device according to claim 10 **characterized in that** the upper face (24) of the second member as a window (31) to access at least to the hook-shaped portion (18) of the blocking means (10) and to the shaped protrusion (17) of the cavity (16) fit to allow acting directly on said elements to uncouple the device also in case of braking of the coupling (25) or of the pivot (22).

12. Device according to claim 11 **characterized in that** it comprises a nameplate (32) with operational indications and fix in removable manner to the upper face (24) of the second member to occlude the window (31).

13. Device according to claim 5 **characterized in that** the arm mean (15) is connected to a mobile end of a linear actuator connected to the second member (3) and fit to activate the blocking means (10) at least to allow the uncoupling.

14. Device according to claim 1 **characterized in that** it comprises two bolt means (6) of elongated shape, approximately prismatic or cylindrical, positioned mutually parallel and fixed to the moving means (9) having shaped-plate form.

15. Device according to claim 14 **characterized in that** the matching mean (8) provides two seats (7), each

consisting of a passing-through opening for an external end of a corresponding bolt mean (6).

16. Device according to claim 14 **characterized in that** the matching mean (8) defines an unique elongated seat (7) for the external ends of the corresponding bolt means (6).

17. Device according to claim 1 **characterized in that** the hooking means comprise a pair of hooks (4) latterly fixed to an end of the second member (3) and two transversal pivots (5), each fixed to respective end of the first member (2); one of said transversal pivots (5) being fit to engage itself in removable manner to the hooks (4) and the another to carry to the matching means (8) of the seat (7) for bolt means (6) and vice versa for the mutual coupling in opposite orientation of the first (2) and second (3) members.

18. Device according to claim 15 or 16 or the 17 **characterized in that** the upper portions, fit to face the driving means (A), of the external ends of the bolt means (6) have respective inclined planes (27) fit to match with a flat portion (28) of each seat (7).

19. Device according to claim 18 **characterized in that** in the connecting condition (C), each inclined plane (27) is parallel to and matching with the corresponding flat portion (28).

20. Device according to claim 15 or 16 or 17 **characterized in that** the elastic means (11) comprise a compressed helicoidal spring for each bolt mean (6).

21. Device according to claim 20 **characterized in that** the helicoidal springs are partially housed in cavity of the bolt means (6).

22. Device second characterized claim 1 **characterized in that** the bolt means (6) are fixed to the moving mean (9) by means of respective coupling means (29).

23. Device according to claim 1 **characterized in that** it comprises a spring mean (30) acting on the blocking means (10) in direction of the external condition.

24. Device according to claims 4 and 17 **characterized in that** the two transversal pivots (5) are cylindrical shaped and the matching surface (14), for the external end (20) of the feeler means (12), is constituted by at least one flattened surface carried on the surface of each of said pivots (5).

25. Device according to claims 17 and 18 **characterized in that** the two transversal pivots (5) are cylindrical shaped and that each of them has at least a respective flat portion (28) for the inclined planes (27) of the bolt means (6), said flat portions being constituted by a flattened surface carried out on the surfaces of said pivots (5).

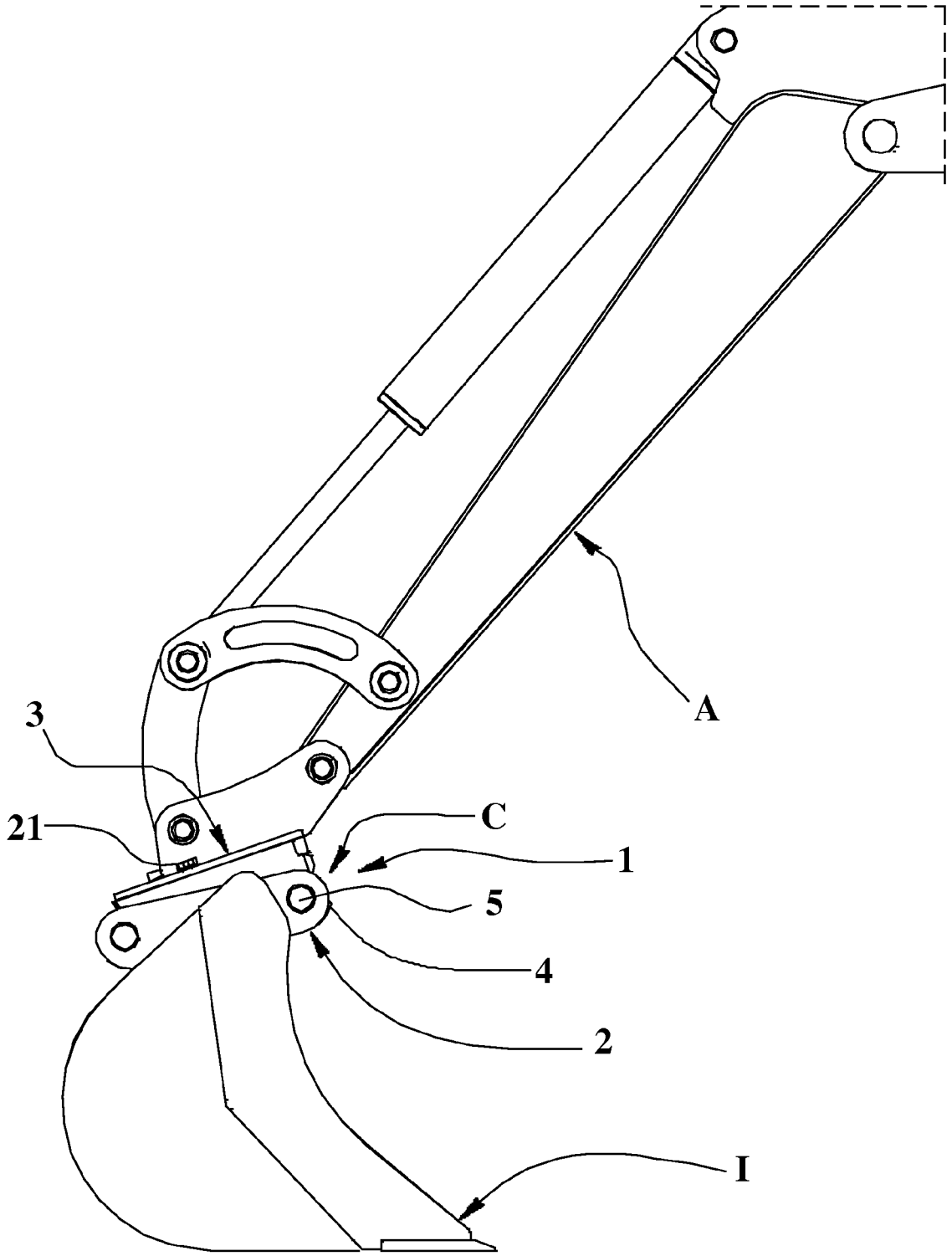


FIG.1

FIG.2

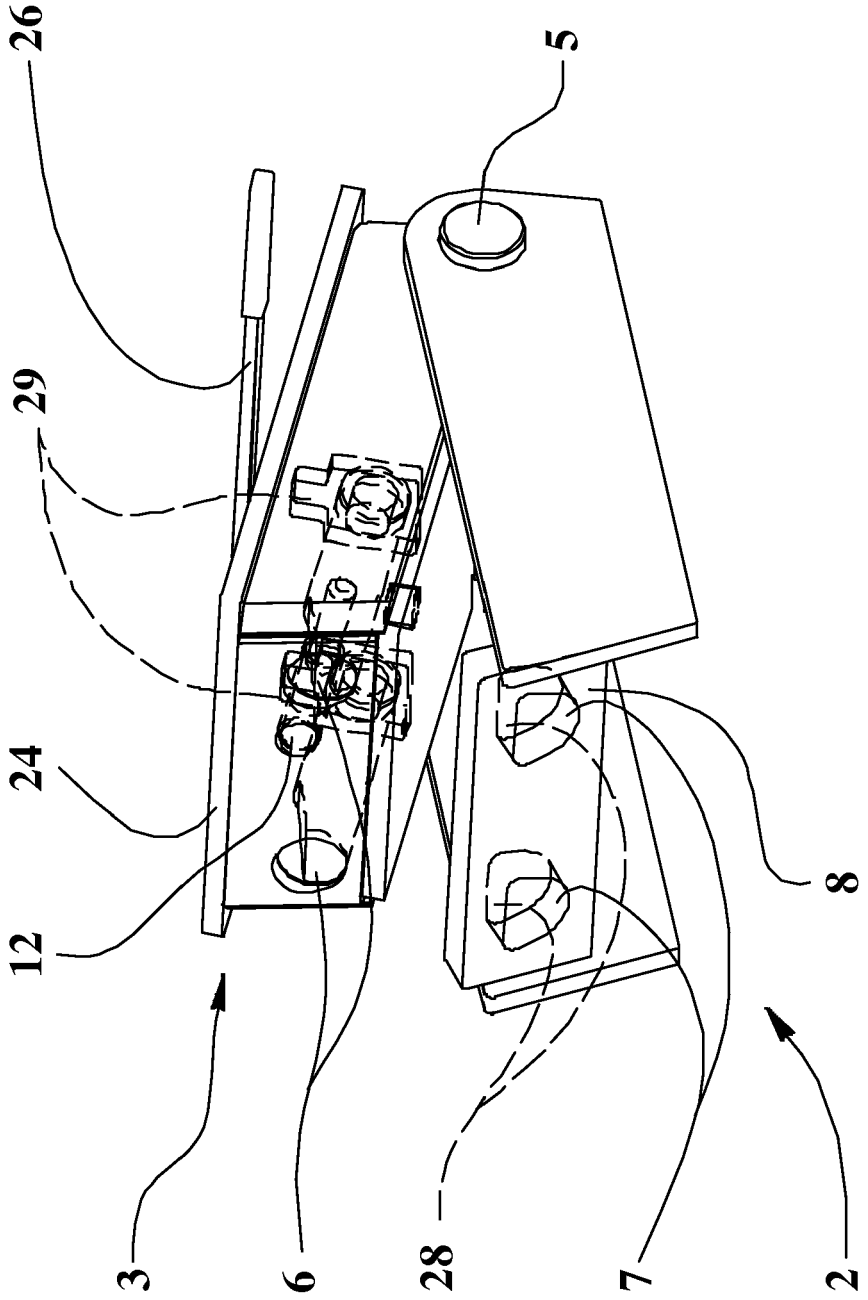


FIG.3

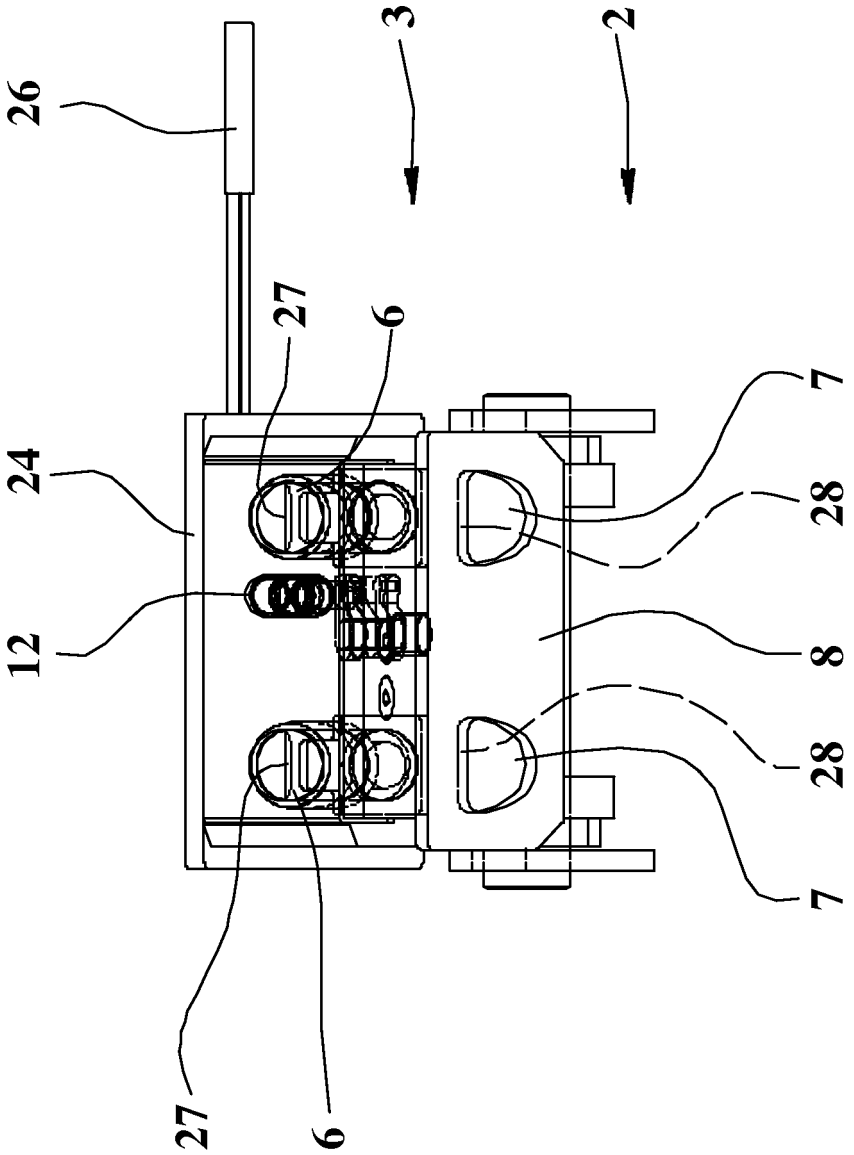
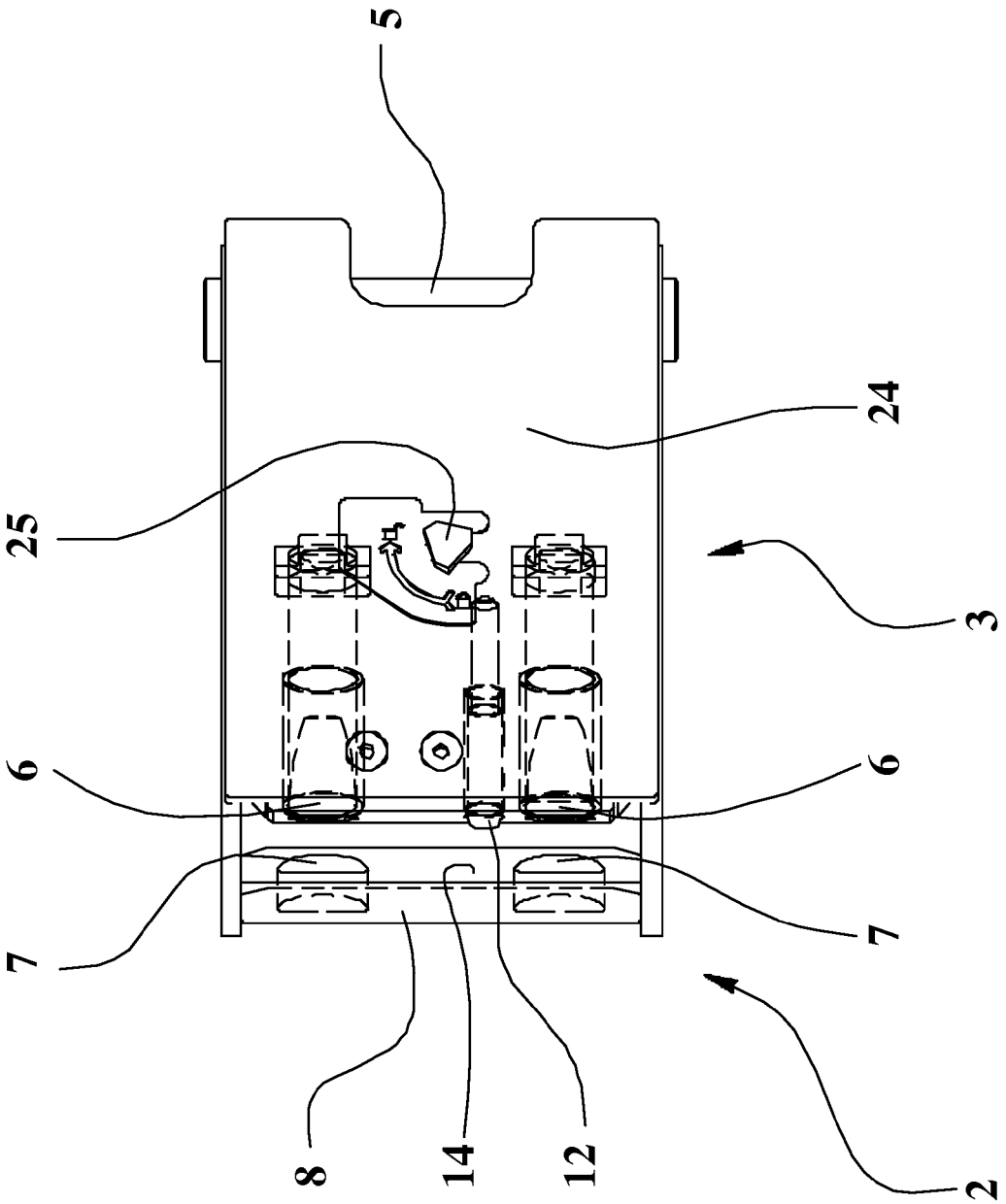


FIG.4



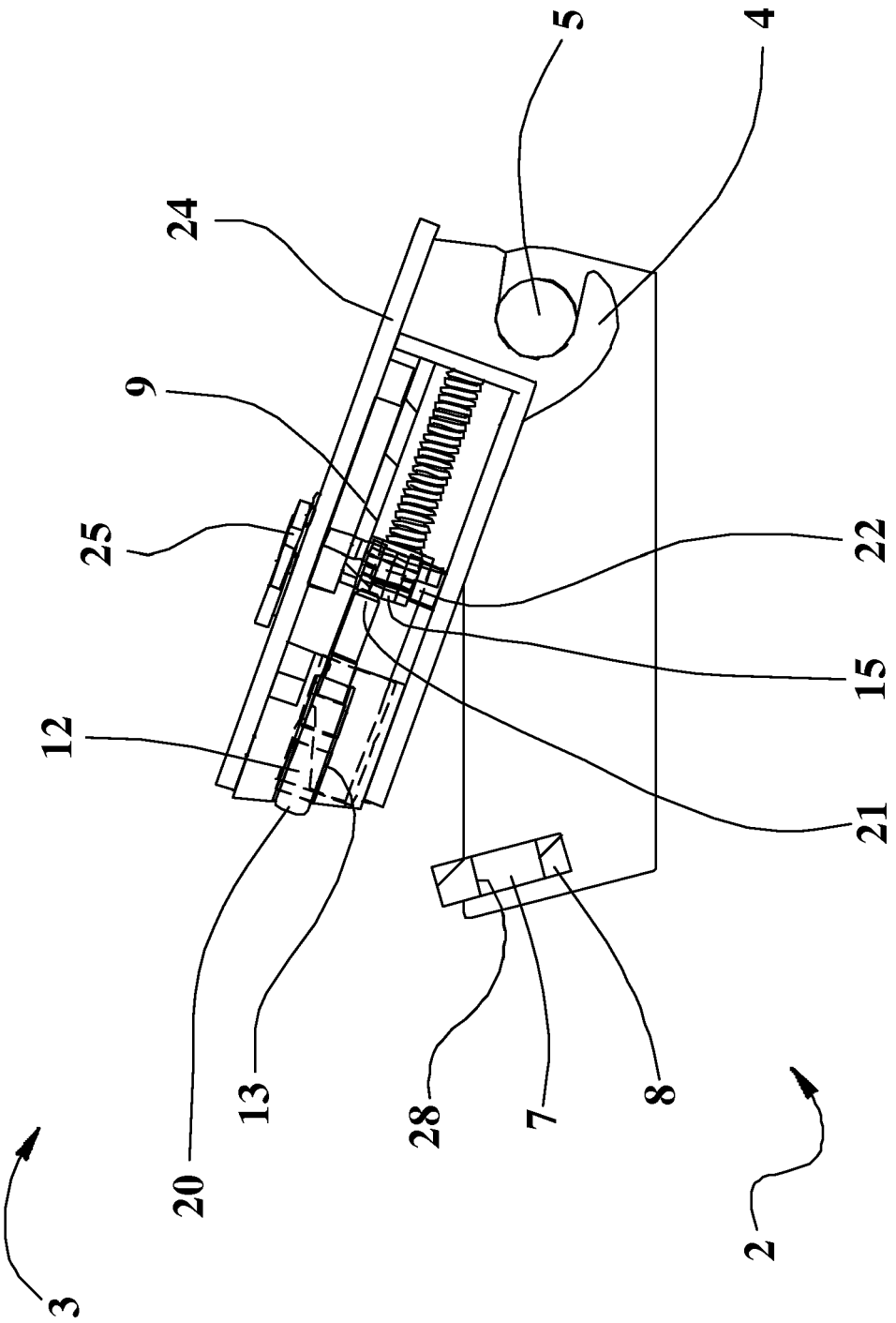


FIG.5

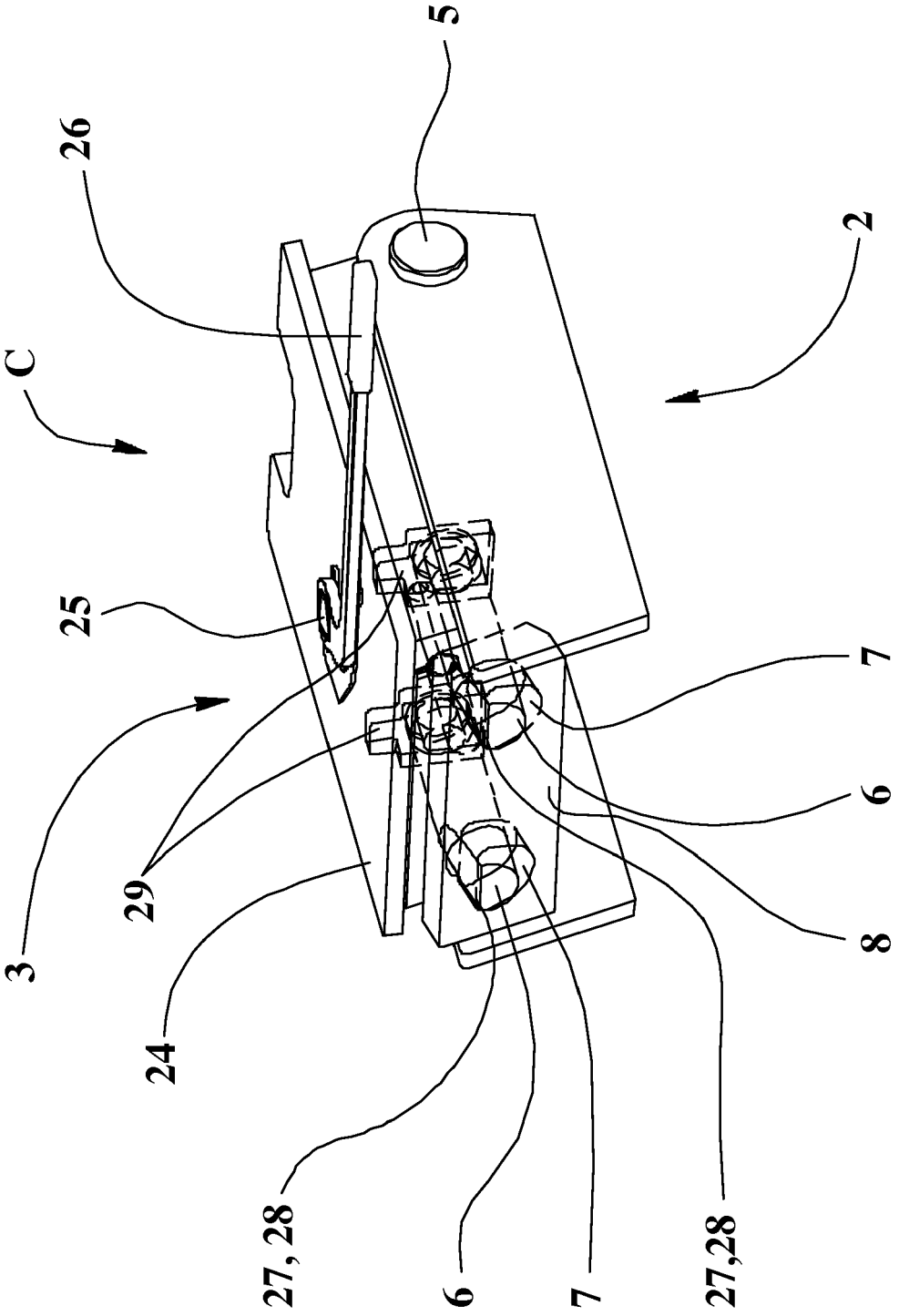
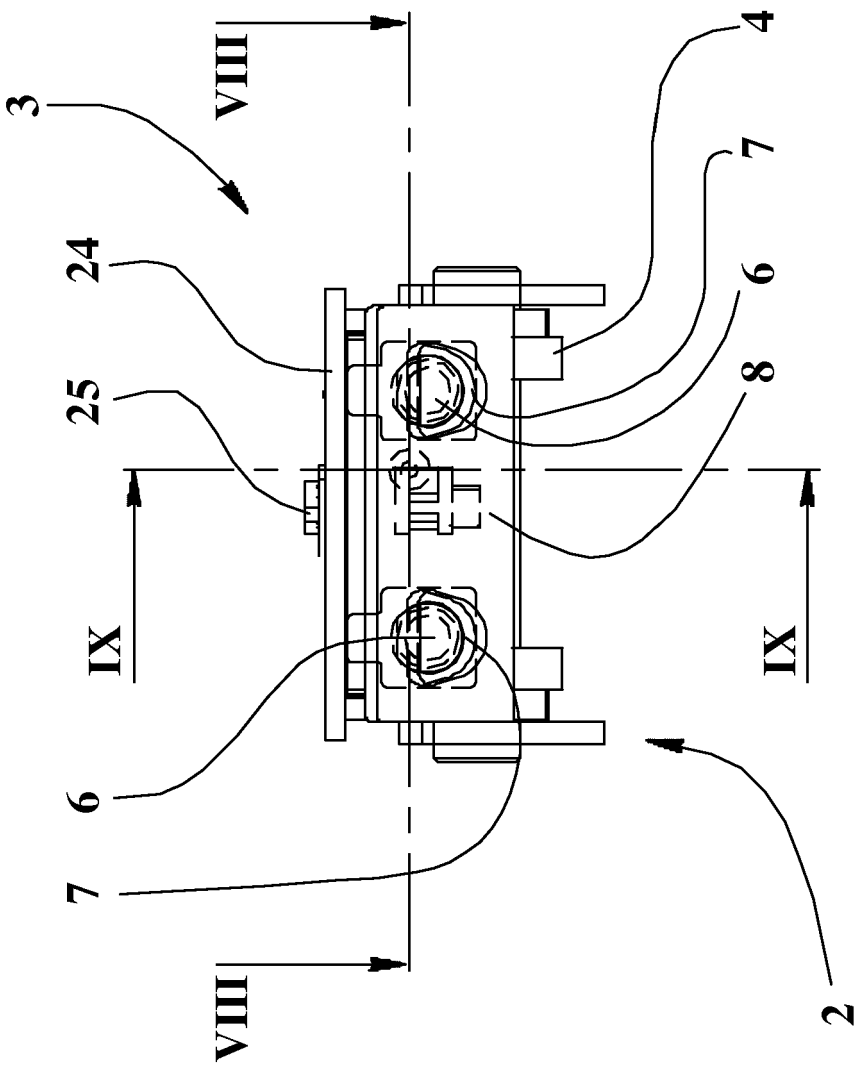


FIG.6

FIG.7



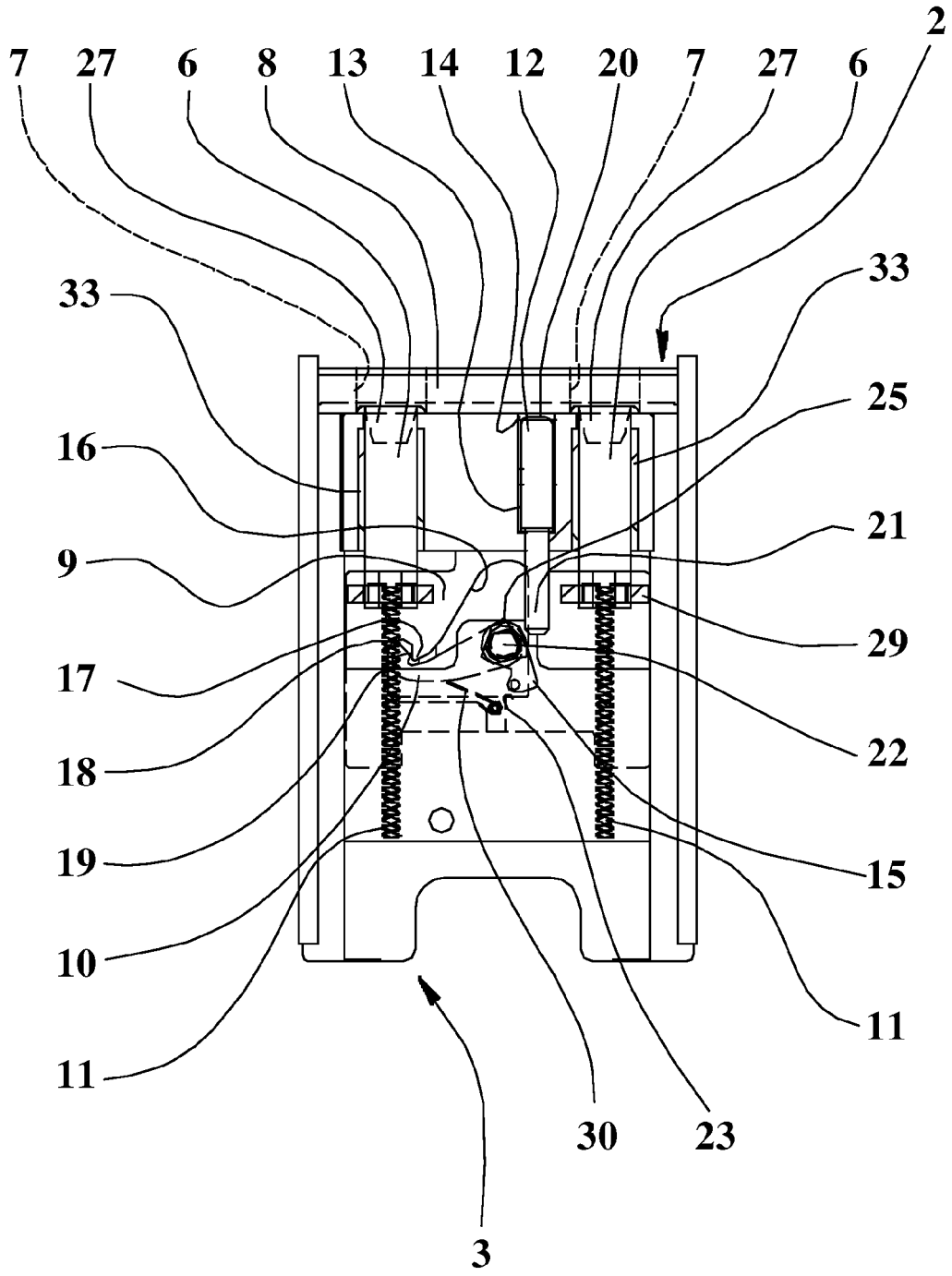

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FIG.8

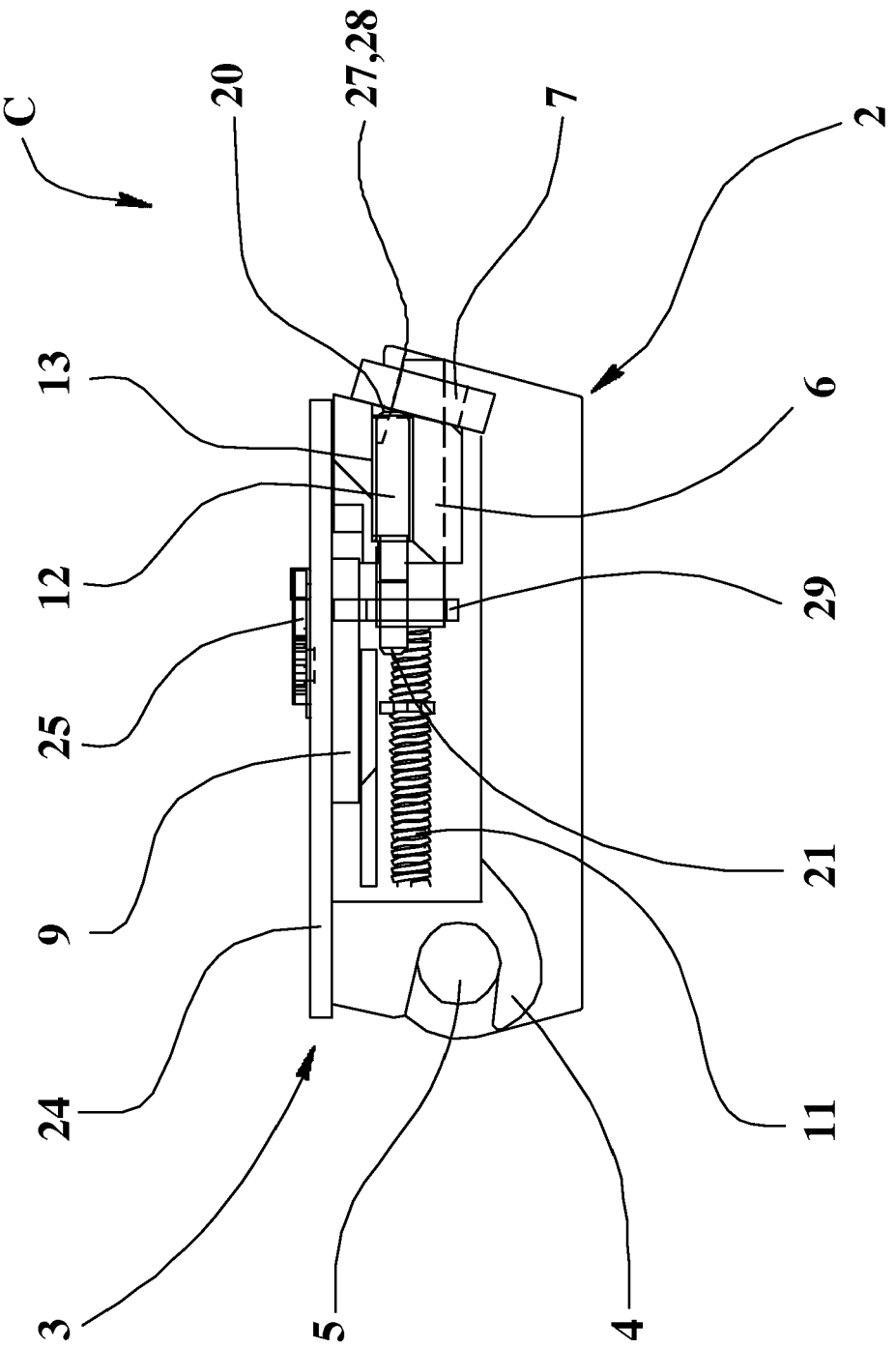


FIG.9

FIG.10

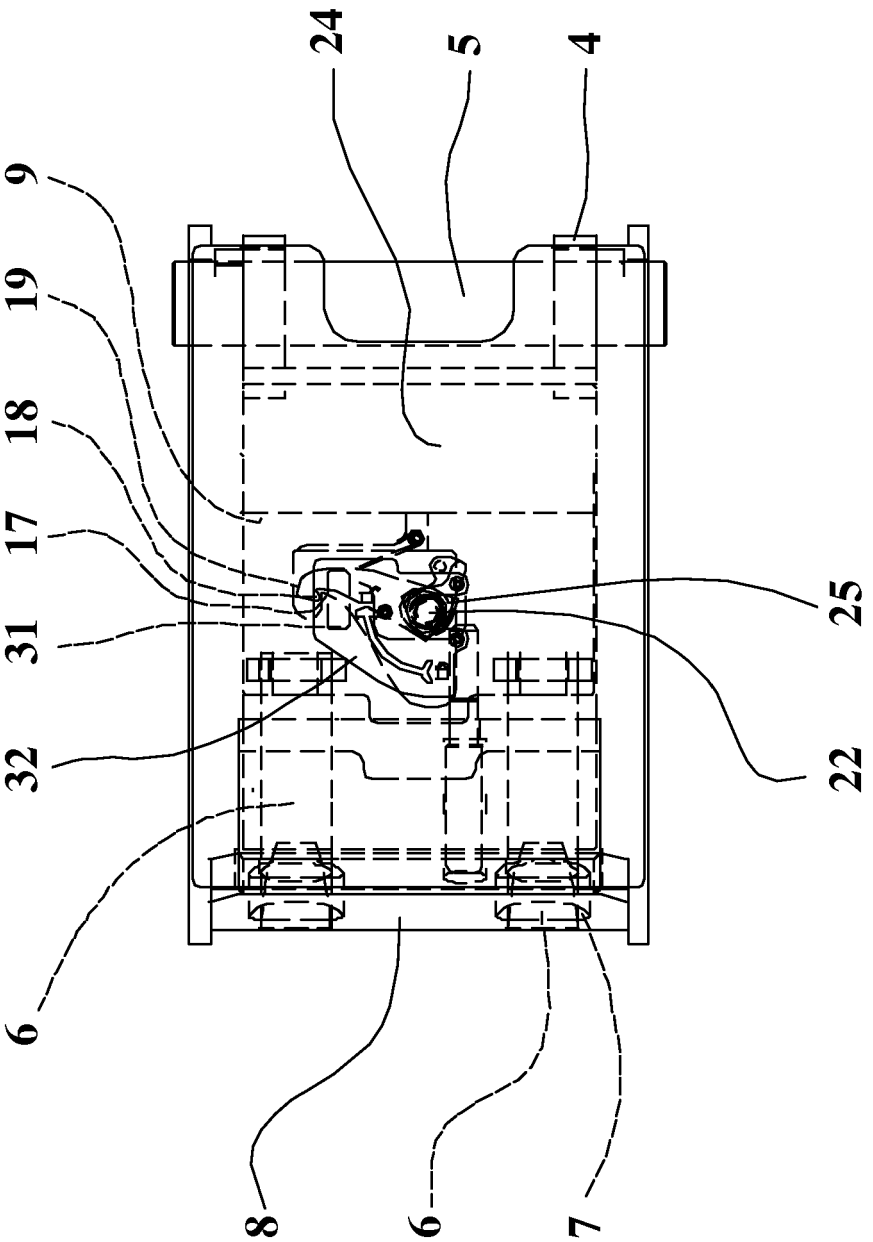
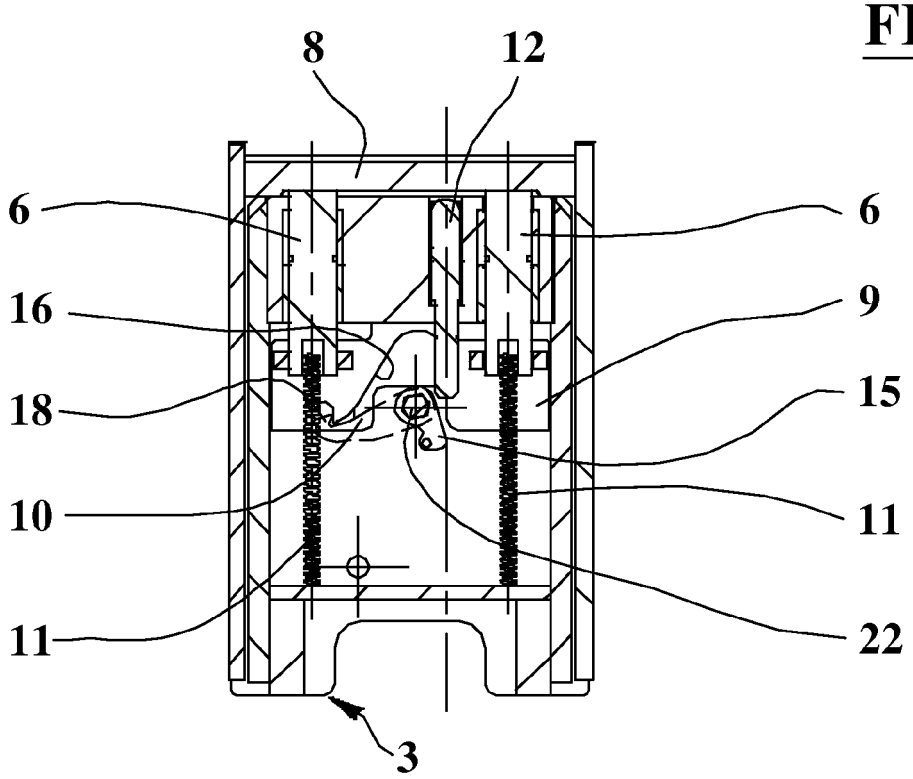


FIG.12



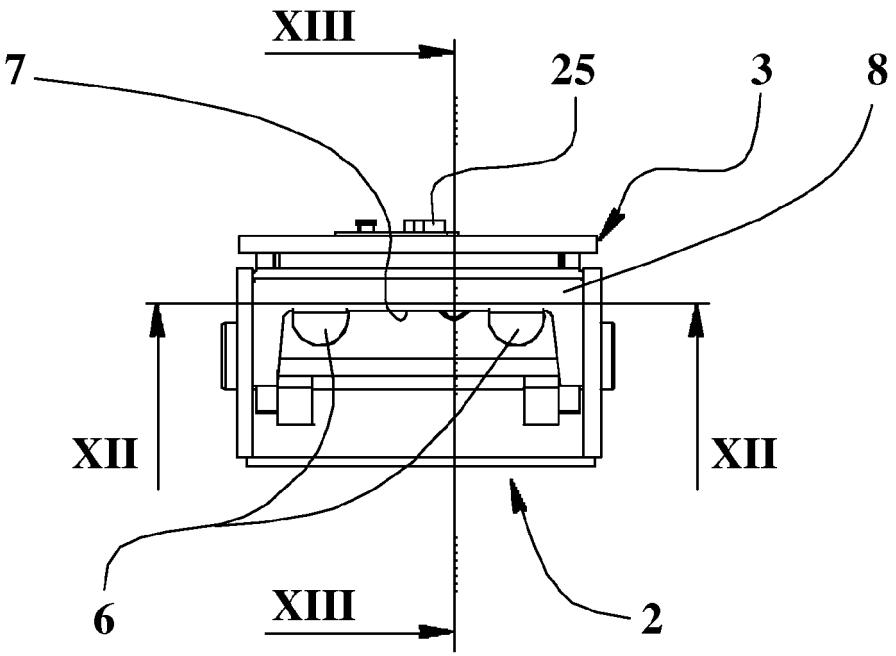
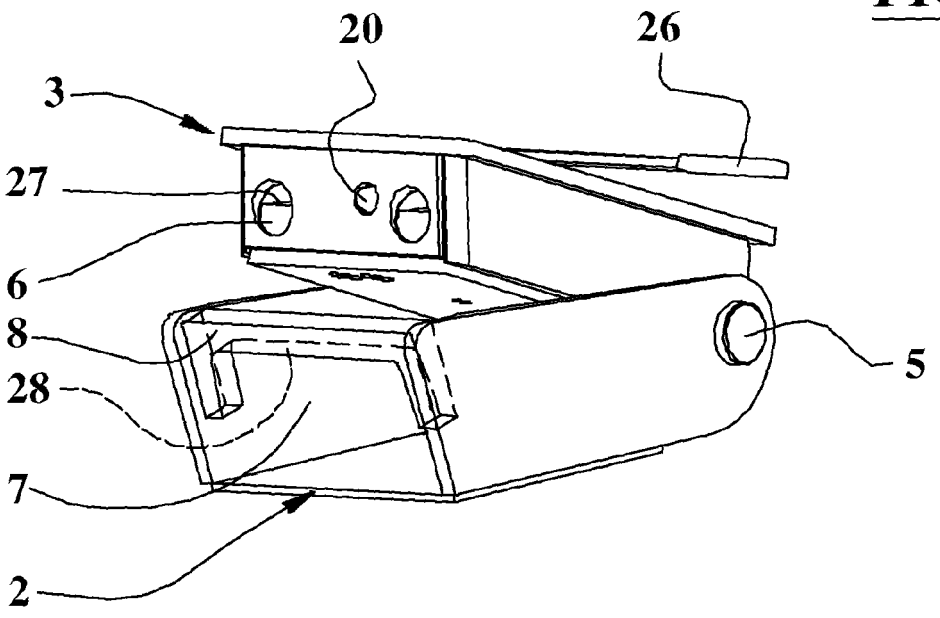


FIG.11

FIG.14



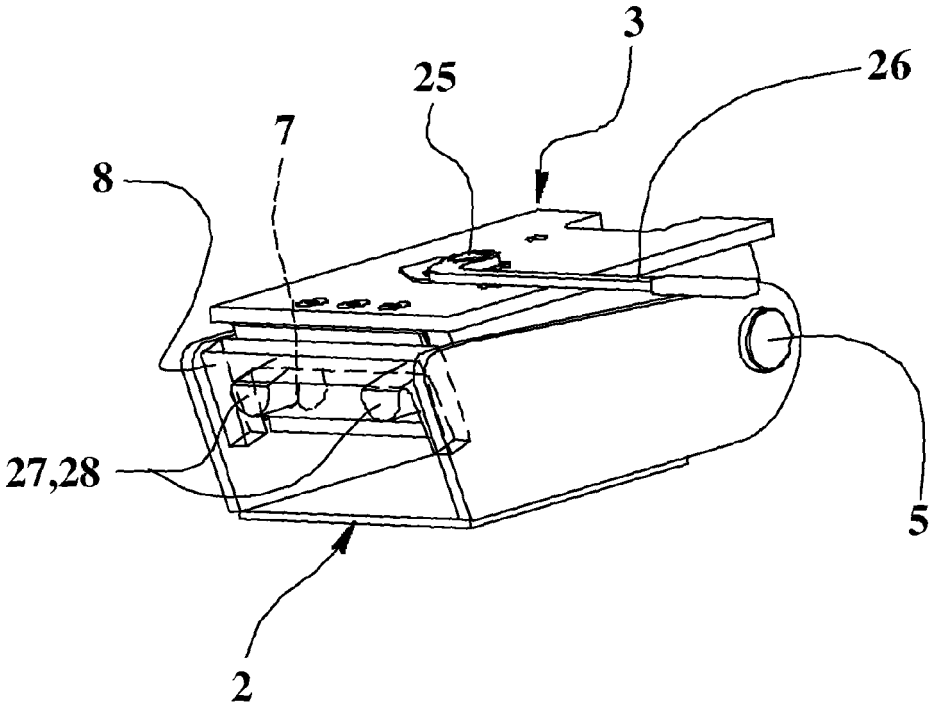
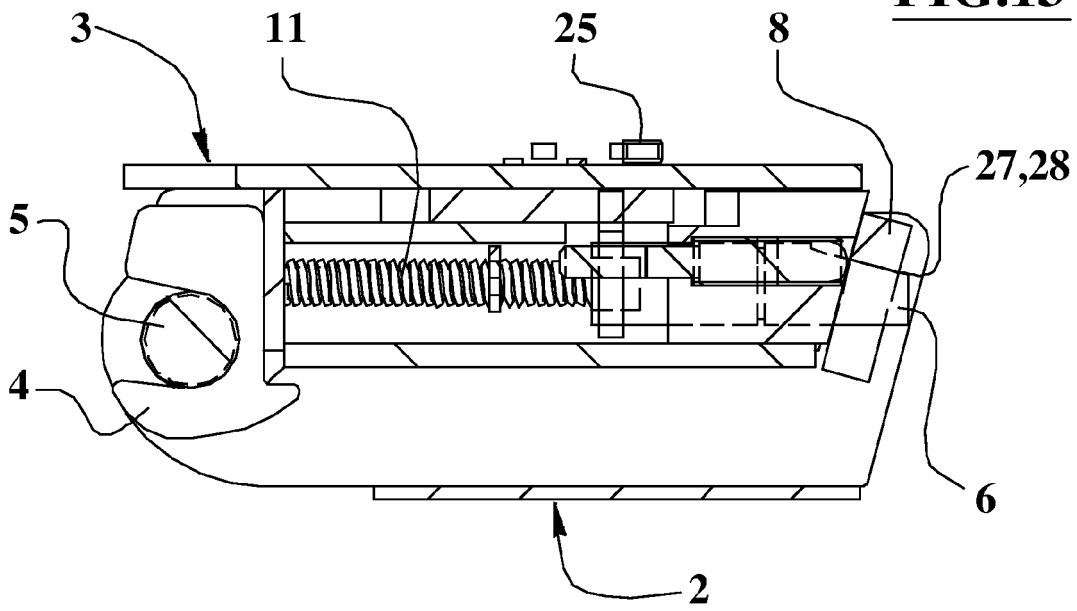


FIG.15

FIG.13



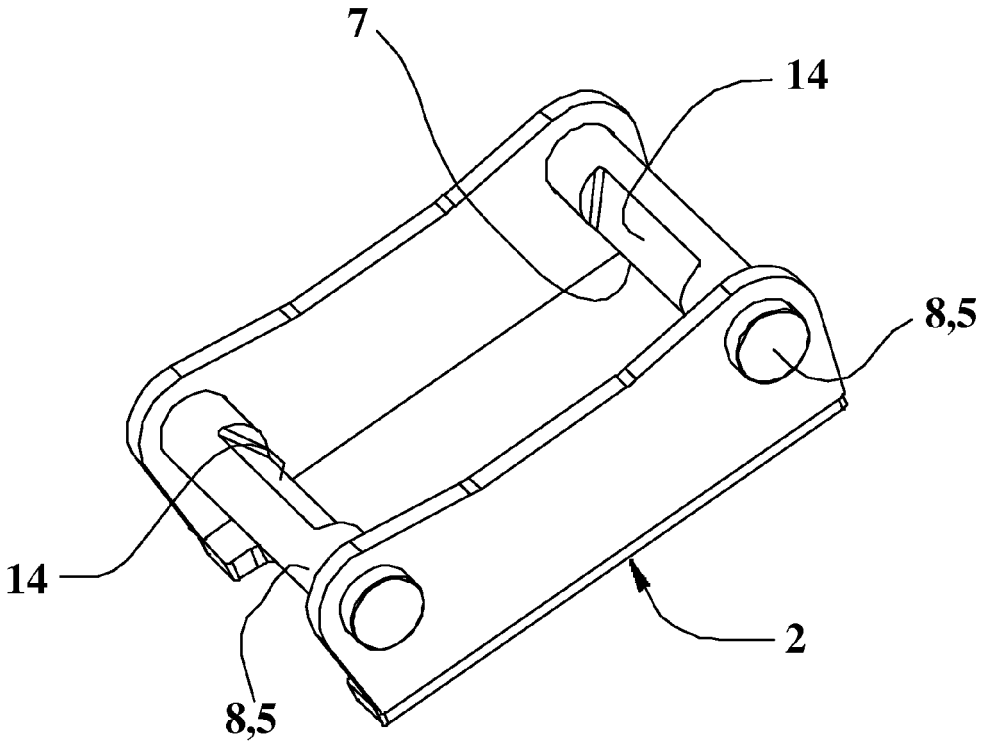
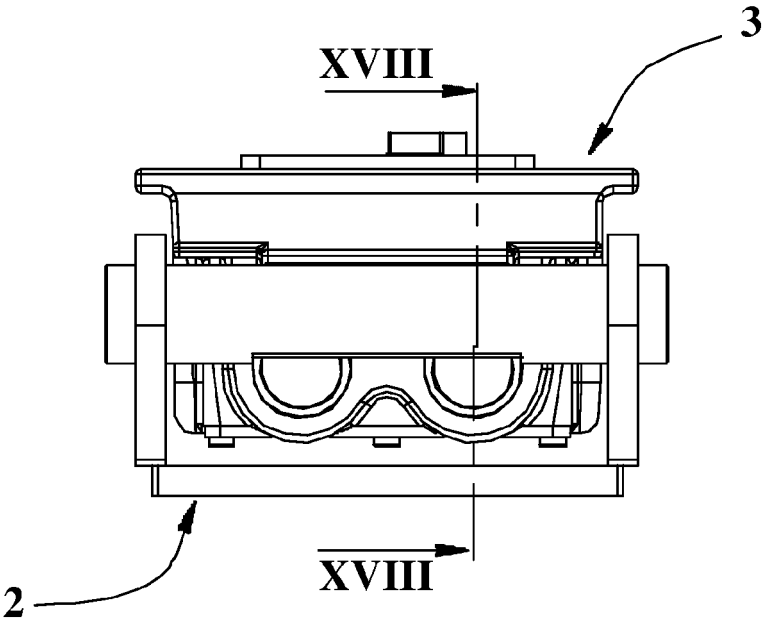


FIG.19

FIG.16



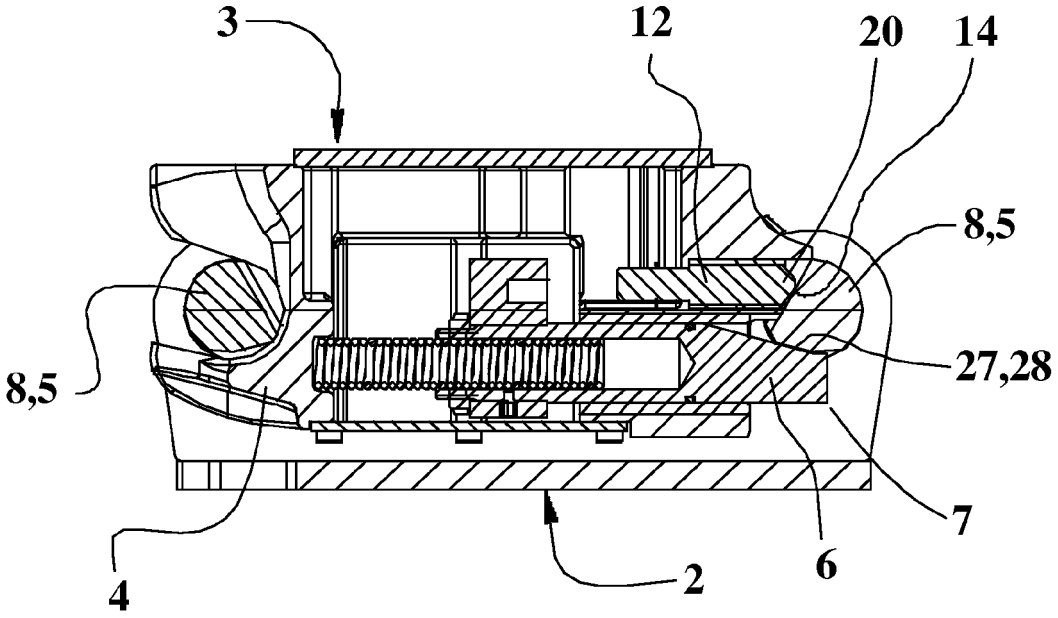
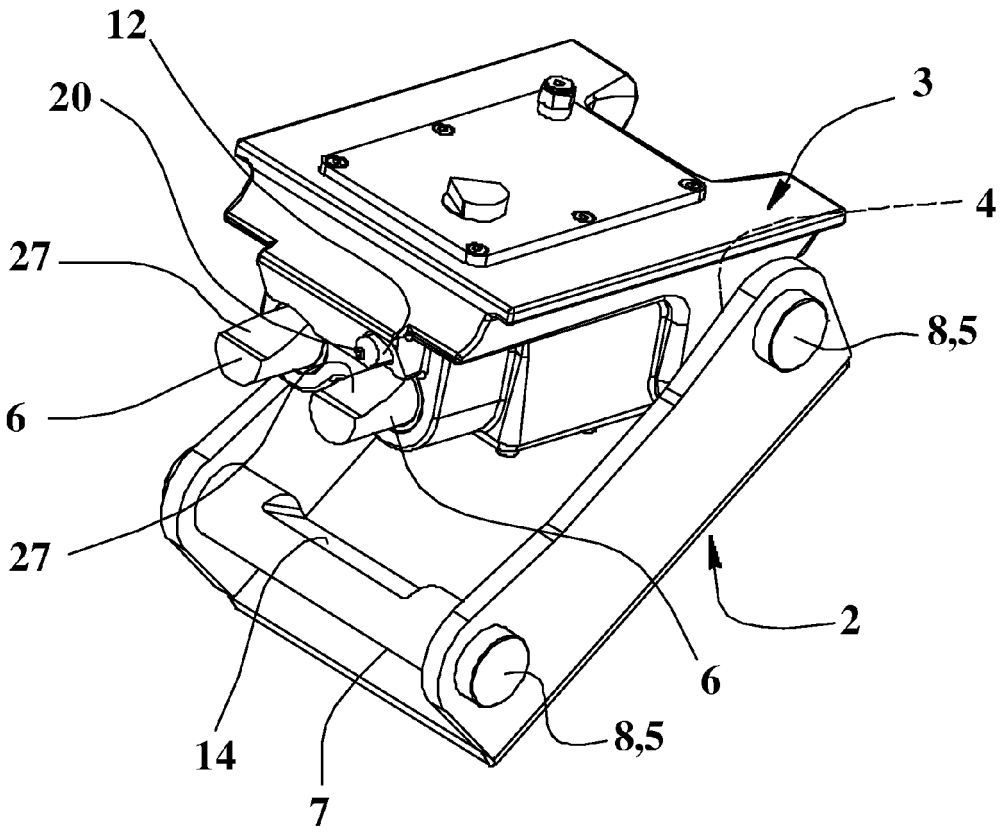


FIG.17

FIG.20



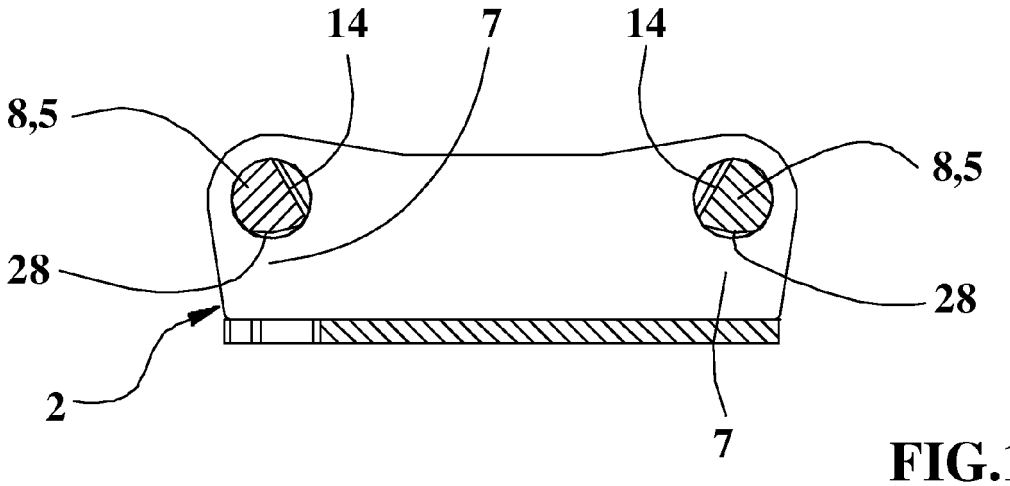


FIG.18