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(54) **DEVICE WITH SAFETY BLOCK FOR CONNECTING A TOOL TO AN OPERATING MEANS**

(57) A device with safety block for connecting a tool (T) to an operating means (A) includes a first member (2) and a second member (3) fit to be fixed one to the tool (T) and the other to the operating means (A).

Said members (3, 2) have respective hooking means (4, 5) for the reciprocal removable hooking. One of said members (3, 2) is furthermore provided with at least one latch means (6) sliding therein (3, 2) between an internal condition (I) and a protruding condition (E) in which the at least a latch means (6) can engage at least one seat (7) of a matching means (8) of the other member (2, 3) for carrying out, cooperating with the hooking means (4, 5), the connecting condition (C) between the tool and the operating means.

The member (3, 2) that is provided with at least a latch means (6) includes moreover elastic means (11)

acting on the at least one latch means (6) in the direction of protruding condition (E) and includes safety locking means (40) for carrying out at least one stop condition of the at least one latch means (6) in the connecting condition (C).

The locking means (40) include an oscillating body (41), pivotally connected to a fixed part of the respective member (3, 2), and having at least one cam surface (42) and at least one blocking seat (43) and an unlocking seat (44).

The at least one latch means (6) is rigidly connected to a sliding mean (45) actuated by the cam surface (42), between the locking (43) and unlocking (44) seats following the rotation of the oscillating body (41) for moving, with contrast of elastic means (11), the at least one latch means (6) from the protruding condition (E) to the internal condition (I) and vice-versa.

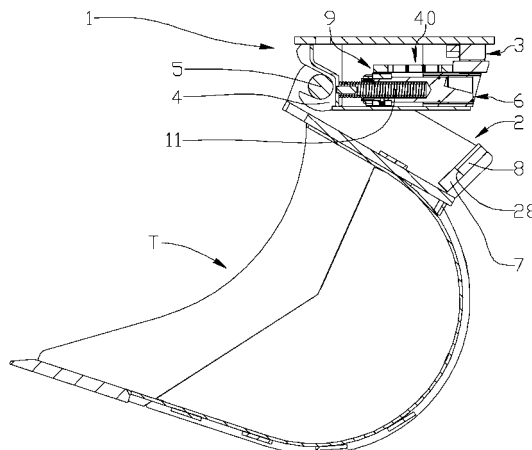


FIG.2

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## Description

**[0001]** The present invention refers to mechanical connections and to a device with safety block for connecting a tool to an operating means, generally suitable to connect various mechanical elements and specially suitable to connect mechanically and removably a bucket or other demolition or movement tool, for gardening and similar to an arm or to a support of a working vehicle, such as a tractor.

**[0002]** Devices used for connecting re-moveably tools are well-known, such as buckets and demolition percussion hammers, to operative supports, such as articulated arms of earthmoving self-propelled machines, for demolition or other.

**[0003]** Such well-known devices are provided with a first member blocked to tool and with a second member blocked to operative support. Usually a side of a member is provided with a transverse pin for hooks of the corresponding side of the other member. It is therefore possible to lock and to unlock the hooks of a member to the pin of the other. In the hooked condition, the two members can reciprocally rotate as a hinge. To block such rotation, preventing the off-hooking and making the connection between members, one of them is equipped with a sliding latch between an internal condition and a protruding one in which the member can be engaged in a respective seat obtained in the other.

**[0004]** To avoid that the strong operative stresses may cause the undesired and dangerous disengaging of the latch by its seat, some connecting devices are equipped with elements for reversibly blocking the latch in the protruding condition.

**[0005]** A disadvantage of these well-known devices consists in that they have means suitable for moving the sliding latch, between the protruding and internal conditions, that are uncomfortable and/or not so much reliable.

**[0006]** Additional disadvantage consists in that the well operation of said known devices requires a precise making of the device causing an increasing of production costs and risks of bad functioning in case of excessive tolerances.

**[0007]** Another disadvantage of these well-known devices consists in that the elements for reversibly blocking the latch in the protruding condition, in consequence of the wear of the device, can fail in locking the latch in such condition.

**[0008]** An additional disadvantage of these well-known devices consists in that they can jam because of earth or other material inwardly penetrated.

**[0009]** An object of this invention is to propose a device with safety block for connecting a tool to an operating means provided with means suitable for moving in a simply and reliably way the sliding latch between the protruding and internal conditions.

**[0010]** Additional object is to propose a device suitable for correctly working, ensuring the safety block of the latch, also in the case of construction of its pieces with

high tolerances.

**[0011]** Another object is of proposing a device suitable for correctly working also after that an high and prolonged use has wear down its components.

5 **[0012]** Another object is to propose a device suitable for avoiding or reducing the earth, powders, sands and debris incoming inside itself and fit to ensure a reliable working in any conditions.

10 **[0013]** The characteristics of invention are in the following evidenced with particular reference to the joined drawings in which:

- figure 1 shows a schematic side-view of the device with safety block for connecting a tool to an operating means, object of the present invention and associated with such tool, consisting of a bucket, and operating means, consisting of an hydraulic arm of a tractor;
- 15 - figure 2 shows a view of the device of figure 1 in a hooking condition of two of its members and sectioned by a median and vertical plane;
- 20 - figures 3 and 4 show a sectional and at different scale views of the device of figure 2 in conditions respectively rotated and locked;
- 25 - figure 5 shows an axonometric and exploded view of the device of figure 1;
- figure 6 shows a top view of a second member of the device of figure 1 in a protruding extreme condition of its latch means and in which some parts have been removed to make better in evidence others;
- 30 - figures 7, 8 and 9 show top views of the second member of figure 6 in conditions respectively of locking, of unlocking and of safety support.

35 **[0014]** With reference to figures 1-9, numeral 1 indicates the device, object of the present invention, for connecting a tool T to an operating means A.

**[0015]** Said device 1 includes a first member 2 and a second member 3, to be fixed, for example by means of welding and/or screw means, to tool T and to the operating means A.

**[0016]** The first 2 and second 3 members have respective hooking means 4, 5 for the reciprocal removable hooking.

45 **[0017]** The second member 3, in general higher than the first 2 in operating conditions, is provided with two latch means 6 parallel and reciprocally connected by a movable means 9 sliding in the body of such second member 3 between an internal condition I and a protruding condition E of latch means 6. In the protruding condition E, end or better intermediate, the latch means 6 can engage, in a hooking and approaching condition among the members 2, 3, respective seats 7 of a matching means 8 of the first member 2 for carrying out, in cooperating with hooking means 4, 5, the connecting condition C between tool and operating means.

55 **[0018]** The device 1 includes moreover elastic means 11 consisting in two helical springs acting in compression

between a fixed portion of the second member 3 and the two latch means 6, or on the movable means 9, in direction of the protruding condition E of latch means 6.

**[0019]** The device 1 includes also locking means 40 destined at least to make a stop condition in the protruding condition E of the movable means 9 and of latch means 6 at least in the connecting condition C of the device 1.

**[0020]** Such locking means 40 include an oscillating body 41, pivotally connected to a fixed part of the second member 3 by means of a rotation pin 47 that is parallel to the sliding mean 45, and is perpendicular to the direction of the motion of latch means 6.

**[0021]** The sliding mean 45 is fixed between the action lines of the two helical springs of elastic means 11.

**[0022]** The oscillating body 41 is centrally provided with a passing through shaped hole 48 having elongate slot shape with curved plan and equipped with concave extensions which carry out seats.

**[0023]** The shaped hole has a folded and elongated edge constituting a cam surface 42, a block seat 43, an unlock seat 44 and a plurality of safety stop seats 50, 51, 52, reciprocally adjacent and preferably in number of three. The invention provides that the number of safety stop seats 50, 51, 52 can vary in relation to parameters and applications; in particular is provided the possibility that the shaped hole has a single safety, eventually with elongate shape. An additional alternative provides that the shaped hole can have two safety seats or a number of such seats equal or higher of four. The movable means 9, which is locked to the latch means 6 reciprocally fixing these last, is rigidly connected with a sliding mean 45 which, therefore, is rigidly constrained to translate with the latch means 6.

**[0024]** The sliding mean 45 is housed in the shaped hole 48 and is actuated by the cam surface 42, following the rotation of the oscillating body 41, for sliding with contrast of elastic means 11, from the locking seat 43, in which the latch means 6 are in the maximum protruding condition E, at unlock seat 44 in which the latch means 6 are in the internal condition I.

**[0025]** The locking 43 and unlock 44 seats are placed at the ends of the cam surface 42 and define the rotation end positions of the oscillating body 41 and translation positions of latch means 6.

**[0026]** The end of the blocking seat 43 adjacent to the cam surface 42 and through which the sliding mean 45 exits from said blocking seat, is equipped with a stop means 46 slightly protruding in almost parallel direction and with direction opposite to the action lines of elastic means 11. Such stop means 46 is designated, in the internal condition I, to match the sliding mean 45 elastically holding in the blocking seat 43.

**[0027]** The edge of the shaped hole 48, forming the cam surface 42, the locking 43 and unlocking 44 seats, the stop means 46 and the safety stop seats 50, 51, 52, is a wall with right generatrix surface parallel to longitudinal axis of the sliding mean 45 or parallel to the rotation

axis of the oscillating body 41 around the respective rotation pin 47.

**[0028]** The sliding mean 45 includes a rolling cylindrical body, for example a nitrided bush, freely rotating around to the axis of such sliding mean 45 and that can rotate matching the edge of the shaped hole 48.

**[0029]** The locking 43, of unlock 44 and of safety stop 50, 51, 52 seats are almost shaped complementary to a portion of the rolling cylindrical body of the sliding mean 45. In particular the locking 43, unlock 44 and safety stop 50, 51, 52 seats are cylindrical wall shaped concavity. The stop means 46 consists in an end of the unlock seat 44 directed so that the tangent of this unlock seat 44 and cam surface 42 in their conjunction point are angled and make an angle preferably obtuse in order to require a light compression of elastic means 11 when the sliding mean 45 exits from the unlock seat 44.

**[0030]** The tangent of the blocking seat 43 and cam surface 42 in their conjunction point are almost coinciding.

**[0031]** The rotation pin 47 is connected at the end of the oscillating body 41 near to the blocking seat 43.

**[0032]** The device 1 includes also a cam means 49 fixed to the oscillating body 41 and provided with an edge reproducing the cam surface 42 to which is exactly aligned for increasing the sliding surface for the sliding means 45.

**[0033]** The locking means 40 include a spring means 53 acting between a fixed portion of the second member 3 and the oscillating body 41 for transmitting to this latter a rotation couple with direction according to the direction towards the protruding condition E.

**[0034]** Such couple acts so that the oscillating body 41 always matches almost the sliding mean 45 so making the device almost free of vibrations induced by hammers or other tools.

**[0035]** Each helicoidal spring of elastic means 11 is partially housed in a longitudinal cavity of the respective latch means 6.

**[0036]** The matching means 8 has two seats 7, each for the passage of a respective latch means 6.

**[0037]** The second member 3 is provided with a box body 60 having a portion, for example in sheet or bent and welded steel plate, to which is fixed, by means of screws, an exit wall 61 provided with two passages 62 for the latch means 6.

**[0038]** The length of the sliding mean 45 is predetermined so that it is almost reaching a fixed part of the box body 60. In such way in case of excessive stresses of latches 6, the sliding mean 45 contacts such fixed part discharging thereon the forces acting onto latches preventing the excessive oscillation.

**[0039]** The cross-sections of two latch means 6 and of the respective passages 62 are circular.

**[0040]** The passages 62 are equipped with respective annular seal means destined to tightness with the two latch means 6.

**[0041]** Each passage 62 is internally provided with two

tubular bodies 63 of low friction material for the sliding of the respective latch means 6.

**[0042]** Each of the latch means 6 is equipped with a concave annular seat for annular seal means, for example of the said O-ring type, fit to the sliding tightness with the internal surface of the respective passage. As an alternative, the invention provides that the two tubular bodies 63 of each passage 62 are spaced to form between them a seat for a respective annular sealing means.

**[0043]** The box body 60 is almost oiltight, or preferably grease-tight, and is equipped with entries for introducing lubricant or preferably grease nipples G for filling the box body 60 with grease for the lubrication and to prevent, in cooperating with the seal means, the incoming of powders, sands or mud.

**[0044]** The device includes also a mobile scanning lever means 12, associated with the second member 3, having an external end towards the matching means 8 at least in conditions next to approaching condition, and having the opposite ends acting onto the locking means 40.

**[0045]** The scanning lever means 12 is actuated, at least near the approaching condition of members, by its matching means with the matching means 8 for acting onto the blocking means 40 eventually with its unlock seat 44 engaged by the sliding mean 45 and for unlocking the latch means 6 so allowing to elastic means 11 to translate such latch means 6 so engaging them in the respective seats 7 realizing the connecting condition C.

**[0046]** The scanning lever means 12 is slidably housed in a through-hole 64 of the exit wall 61.

**[0047]** This passing-through hole 64 is equipped with two second tubular bodies 63 spaced to form between them a seat for a respective annular sealing means matching the scanning lever means 12. As an alternative the seat for the annular sealing means can be obtained in the shaft of the scanning lever means 12.

**[0048]** The through-hole 64 is almost parallel to the passages 62 for the latch means 6.

**[0049]** The rotation pin 47 of the oscillating body 41 has a driving head 54 accessible from outside of the device and to be engageable with a lever-operated tool 55 for the activation in rotation of the oscillating body 41.

**[0050]** The box body 60 has a first opening for the passage of the rotation pin 47 and has a second opening, not illustrated and preferably separated by the first opening, of such dimensions as to allow the access inside the box body 60 allowing to bring directly the latch means 6 in the internal condition I also without acting on the rotation pin 47, for example in case of breaking this latter.

**[0051]** A shaped plate 32, re-moveably fixed on the box body 60, closes the second opening and has operating graphic indications of said rotation pin 47.

**[0052]** As an alternative to the second opening, the invention provides that the exit wall 61 has a screw threaded through-hole, not shown, almost parallel to the latch means 6 and directed towards a portion of the oscillating body 41 spaced from the rotation pin 47. The

screw threaded through-hole is fit to be engaged by a threaded bar for allowing to bring directly the latch means 6 in the internal condition I also without acting on the rotation pin 47, for example when this latter will be broken.

**[0053]** The upper portion, fit to be turned towards the operating means A, of the external end of each latch means 6 has at least one respective chute 27 for matching a flat portion 28 of the seat 7. It is provided that the matching means 8 has a single seat 7 for all the latch means 6 or that has more seats 7, each for the passage of one or more respective latch means 6.

**[0054]** In the connecting condition C, each chute 27 is parallel and matches with the corresponding flat portion 28.

**[0055]** Each latch means 6 has a safety plane 29 outwardly extending beginning from the chute 27 and parallel directed along the longitudinal axis of the respective latch means 6.

**[0056]** The device 1 includes also an arm means 15 fixed to the oscillating body 41 and fit to be connected to an operating actuator in rotation of said oscillating body 41.

**[0057]** A possible operation of the device 1 provides that when it is in the connecting condition C, with the engaged latch means in the respective seats 7 of the matching means 8, the sliding mean 45 is matching the cam surface 42 near the blocking seat 43 and almost faced to the safety stop seats 50, 51, 52. If the vibrations, pulses and/or forces produced by the work of tool T and of action means A push inwardly the latch means, the sliding mean 45 translates inwardly so engaging one of the safety stop seats 50, 51, 52, in general the intermediate 51, preventing the additional inwardly translation of latch means 6 and preventing the disengaging from the respective seats 7 of the matching means 8. If the device 1 is carried out with excessive tolerances, and in particular with longitudinal sizes different from those projected, or if the wearing of device has altered the measures, the inwardly pushes and translations of latch means 6, in the connecting condition C, can bring the sliding mean 45 to match with one of the side safety stop seats 50, 52 ensuring the security of the connection also in case of excessive tolerances and wearing.

**[0058]** The release of the device is carried out by rotating, by means of tool 55 or actuator connected to the arm means 15, the oscillating body 41 until to engage the sliding mean 45 into the unlock seat 44 and carrying the latch means into the internal condition; the detachment is completed by disengaging the hooking means 4, 5. Following such operation, the sliding mean 45 elastically remains held in the unlock seat 44 by the stop means 46.

**[0059]** Starting from the last detachment condition described above, to obtain the connecting condition C is sufficient to hook again the hooking means 4, 5 and to rotate the members, first 2 and second 3, until the scanning lever means 12 matches the matching means 8 pressing it inwardly by acting onto the oscillating body

41 so whose consequent rotation frees the unlock 44 seat from the sliding mean 45 allowing the elastic means 11 to bring the latch means 6 into the protruding condition E engaging the respective seats 7 of the matching means 8 of the first member 2.

**[0060]** An advantage of this invention is to supply a device with safety block for connecting tool to an operating means provided with means for moving in a simple way and reliable the sliding latch between the protruding and internal conditions.

**[0061]** Additional advantage is to supply a device which can work correctly, ensuring the safety block of the latch, also in case of production of its pieces with high tolerances.

**[0062]** Other advantage is to supply a device able to correctly operate also after that a prolonged and heavy usage has wear out the components.

**[0063]** Other advantage is to supply a device fit for avoiding or reducing the incoming of earth, of powders, of sands and of debris, and for ensuring a reliable operation at every condition.

## Claims

1. Device with safety block for connecting a tool (T) to an operating means (A); said device (1) includes a first member (2) and a second member (3) fit to be fixed one to the tool (T) and the other to the operating means (A) and having respective hooking means (4, 5) for the reciprocal removable hooking; one of these members (3, 2) is furthermore provided with at least one latch means (6) sliding therein (3, 2) between an internal condition (I) and a protruding condition (E) in which the at least a latch means (6) can engage at least one seat (7) of a matching means (8) of the other member (2, 3) for carrying out, cooperating with the hooking means (4, 5), the connecting condition (C) between the tool and the operating means; the member (3, 2) that is provided with at least a latch means (6) including moreover elastic means (11) acting on the at least a latch means (6) in the direction of protruding condition (E) and safety locking means (40) for carrying out at least one stop condition of the at least one latch means (6) in the connecting condition (C); said device (1) being **characterised in that** the locking means (40) include an oscillating body (41), pivotally connected to a fixed part of the respective member (3, 2), and having at least one cam surface (42) and at least one blocking seat (43) and an unlocking seat (44); the at least a latch means (6) is rigidly connected to a sliding mean (45) actuated by the cam surface (42), between the locking (43) and unlocking (44) seats following the rotation of the oscillating body (41) for moving, with contrast of elastic means (11), the at least a latch means (6) from the protruding condition (E) to the internal condition (I) and vice-versa.

2. Device according to claim 1 **characterised in that** the cam surface (42), the locking seats (43) and unlocking seats (44) are made on the edge of a shaped hole (48), having an elongate slot shape carried out in the oscillating body (41) where such locking seats (43) and unlocking seats (44) are placed at the ends of the cam surface (42) having elongate form and preferably curved.
3. Device according to claim 2 **characterised in that** the edge portion of the shaped hole (48) faced to the cam surface (42) has a plurality of safety stop seats (50, 51, 52).
4. Device according to claim 3 **characterised in that** the safety stop seats (50, 51, 52) preferably are adjacent and in number of three and that the locking seats (43), unlocking seats (44) and safety stop seats (50, 51, 52) are almost shaped complementary to a portion of the sliding mean (45) possibly including a rolling cylindrical body around the axis of the sliding mean (45) and that can rotate with matching the edge of the shaped hole (48).
5. Device according to any of the previous claims **characterised in that** the ends of the blocking seat (43) for the exit of the sliding mean (45) is equipped with a stop means (46) slightly protruding in direction almost parallel and opposite direction to those action directions of elastic means (11) and designated, in the internal condition (I), to match the sliding mean (45) elastically and re-moveably holding in the blocking seat (43).
6. Device according to claim 5 **characterised in that** the stop means (46) is at least partially carried out at the border of the shaped hole (48) made in the oscillating body (41).
7. Device according to any of the previous claims **characterised in that** includes a cam means (49) fixed to the oscillating body (41) and provided with an edge reproducing the cam surface (42) to which exactly is aligned for increasing the sliding surface for the sliding means (45).
8. Device according to any of the previous claims **characterised in that** includes a scanning lever means (12) movable associated to one of the members (3, 2), directed towards the backing means (8) at least in conditions next to approaching one, and acting onto the blocking means (40); said scanning lever means (12) being driven, at least near the approaching condition of members, by its matching with matching means (8) for acting onto the blocking means (40) and unlocking the at least a latch means (6) so allowing the elastic means (11) to translate such at least one latch means (6) engaging this latter

in the at least a seat (7) making the connecting condition (C).

9. Device according to claim 8 **characterised in that** the member (3, 2) having the at least a latch means (6) includes a box body (60) provided with an exit wall (61) equipped with at least one passage (62) for the at least a latch means (6); the scanning lever means (12) is slidably housed in a through-hole (64) parallel to the at least one passage (62) for a latch means (6) carried out in the exit wall (61) and provided with two second tubular bodies (65) spaced to form among them a seat for a respective annular sealing means matching the scanning lever means (12). 5
10. Device according to claim 9 **characterised in that** the oscillating body (41) rotates around a rotation pin (47) that is parallel to the sliding mean (45), is connected at an end of the oscillating body (41) and is perpendicular to the direction of the motion of the at least one latch means (6), such rotation pin (47) has a driving head (54) engageable with a tool (55) for operating in rotation the oscillating body (41) and accessible from outside of the device through a first opening of the box body (60) which has a second opening of such dimensions as to allow the access inside the box body (60) for allowing to bring directly the at least one latch means (6) into the internal condition (I) also without acting on the rotation pin (47); the box body (60) has a shaped plate (32) removably fixed thereto for closing the second opening; such shaped plate (32) being able to carry operating graphic indications of said rotation pin (47). 10
11. Device according to claims from 7 to 10 **characterised in that** the exit wall (61) has a screw threaded through-hole, parallel to the at least one latch means (6) and directed towards a portion of the oscillating body (41) spaced from the rotation pin (47); said threaded through-hole being fit to be engaged by a threaded bar to bring directly the latch means (6) into the internal condition (I) also without acting on the rotation pin (47), for example in case of breaking this latter. 15
12. Device according to claim 1 **characterised in that** includes an arm means (15) fixed to the oscillating body (41) and fit to be connected to an operating actuator of rotation of said oscillating body. 20
13. Device according to claim 1 **characterised in that** the locking means (40) include a spring means (53) acting between a fixed portion of the member (3, 2) having the at least one latch means (6) and the oscillating body (41) for transmitting to this latter a rotation couple with according direction to which towards the protruding condition (E). 25

14. Device according to claim 9 **characterised in that** the sliding mean (45) is placed between the action lines of two helical springs of elastic means (11), that the length of the sliding mean (45) is predetermined so that almost reaches a fixed part of the box body (60), that the sliding mean (45) is fixed, by means of a movable means (9) sliding in the body of the respective member (3, 2), with two latch means (6) elongate shaped and at least almost parallel, slideable in one or more seats (7) of the matching means (8) where the elastic means (11) include two helical springs acting in compression between a fixed portion of the member (3, 2) having the latch means (6) and the latter and in which each helicoidal spring of the elastic means (11) is partially housed in a longitudinal cavity of the respective latch means (6) and that each passage (62) situated in the box body (60) for the at least one latch means (6) is equipped with two tubular bodies (63) spaced to form among them a concave seat for a respective annular sealing means in which tight slides the respective latch means (6). 30

15. Device according to claim 1 **characterised in that** the upper portion, fit to be turned towards the operating means (A), of the external end of each latch means (6) has at least one respective chute (27) for matching a flat portion (28) of the respective seat (7) equally inclined; in the connecting condition (C), each chute (27) is parallel and matches the corresponding flat portion (28) and **in that** each latch means (6) has a safety plane (29) outwardly extending beginning from the chute (27) and oriented parallel to the longitudinal axis of the respective latch means (6). 35

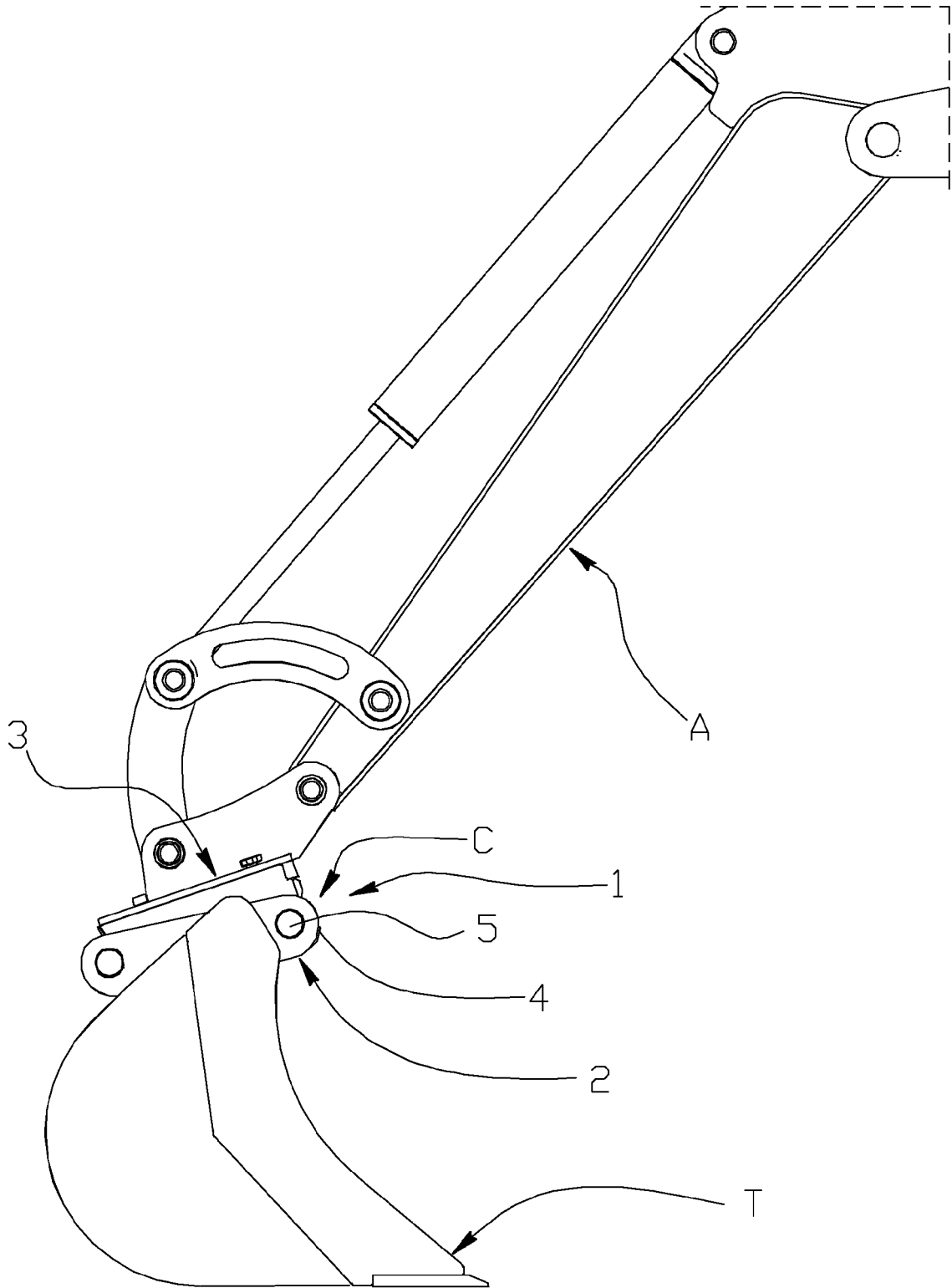


FIG.1



FIG.3

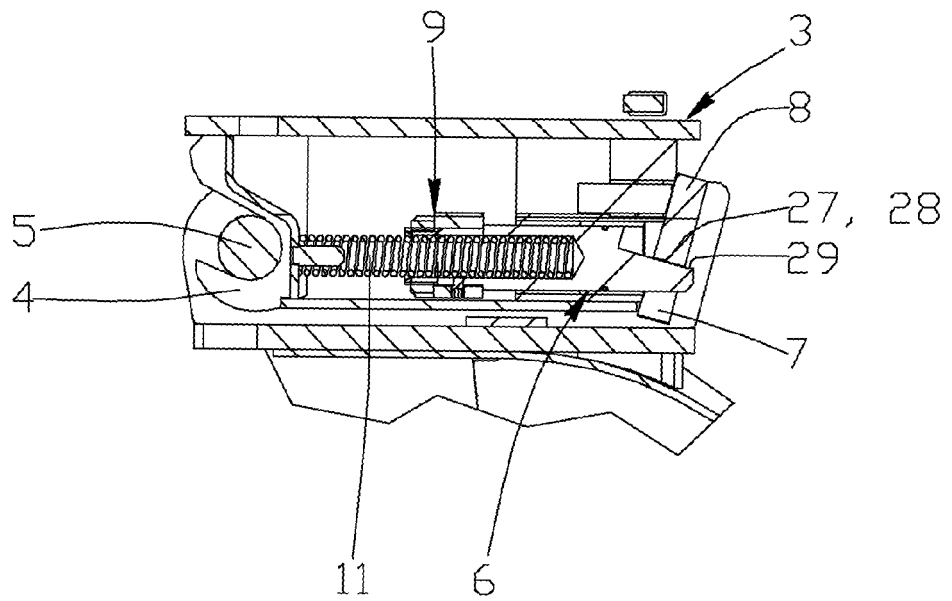
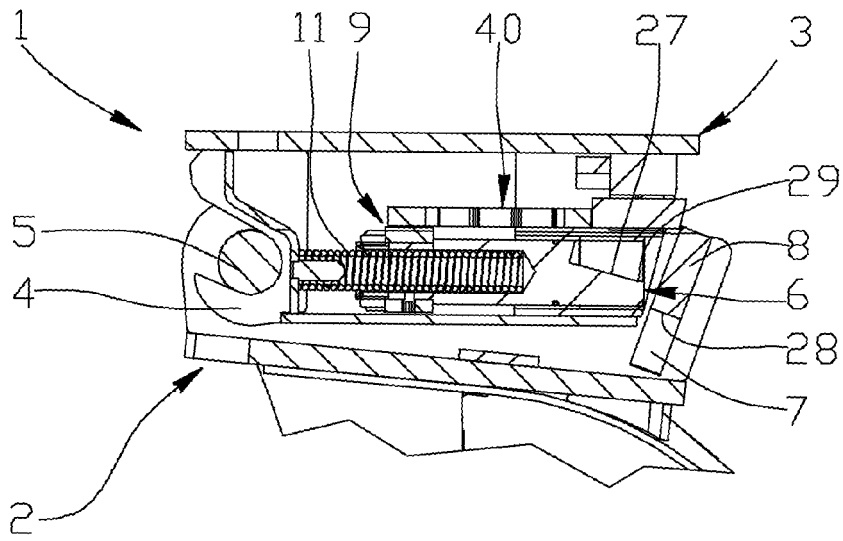


FIG.4

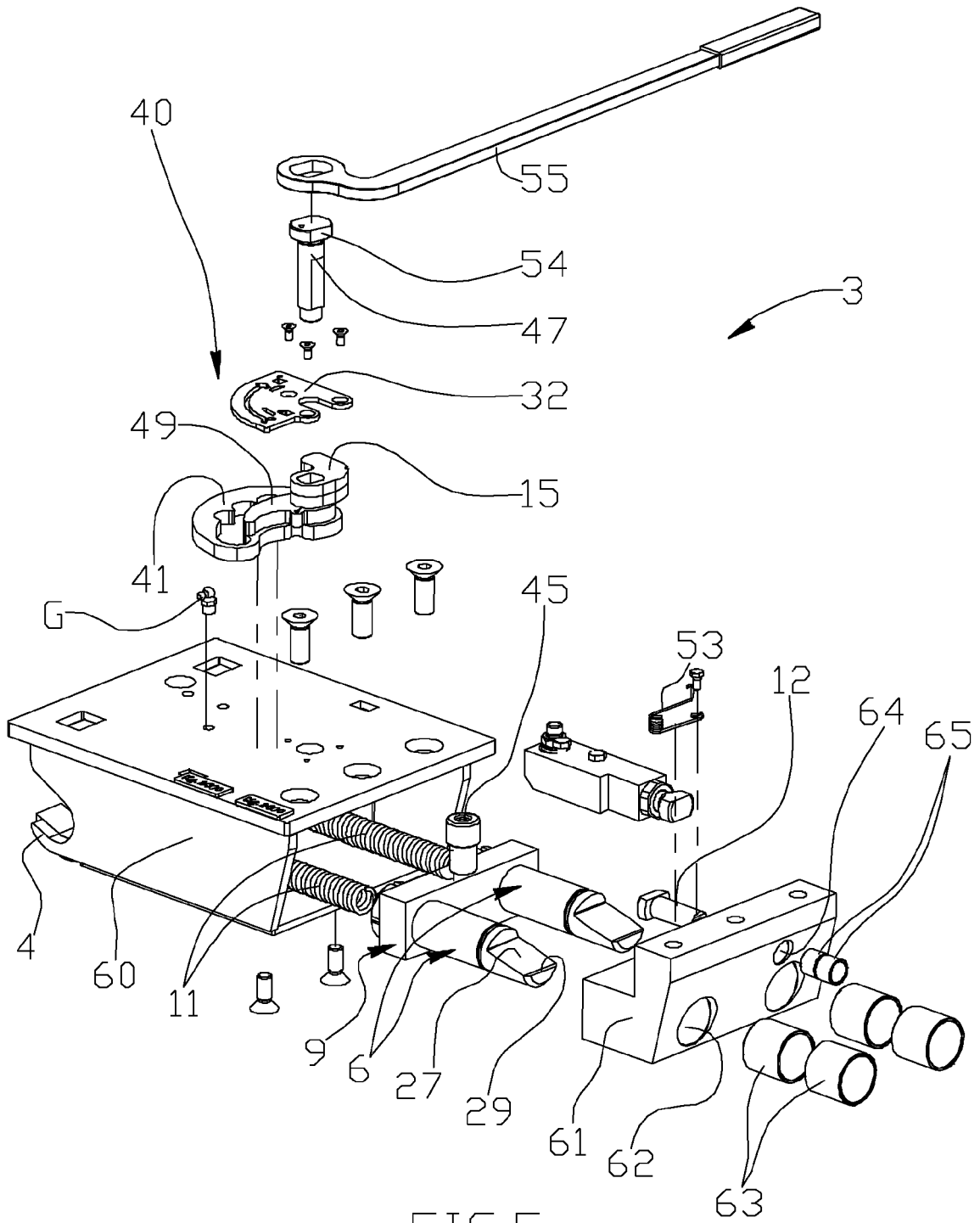


FIG. 5



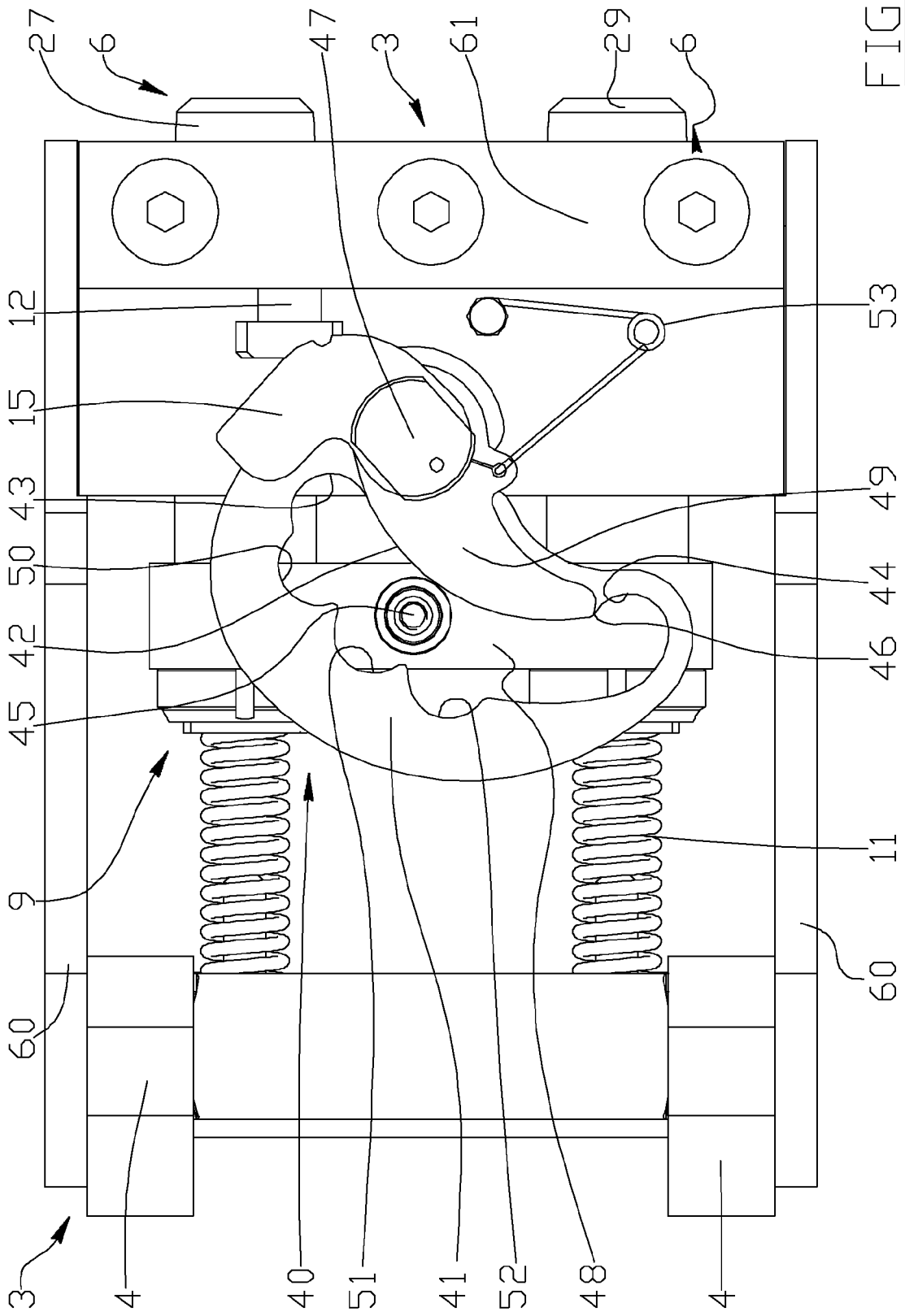
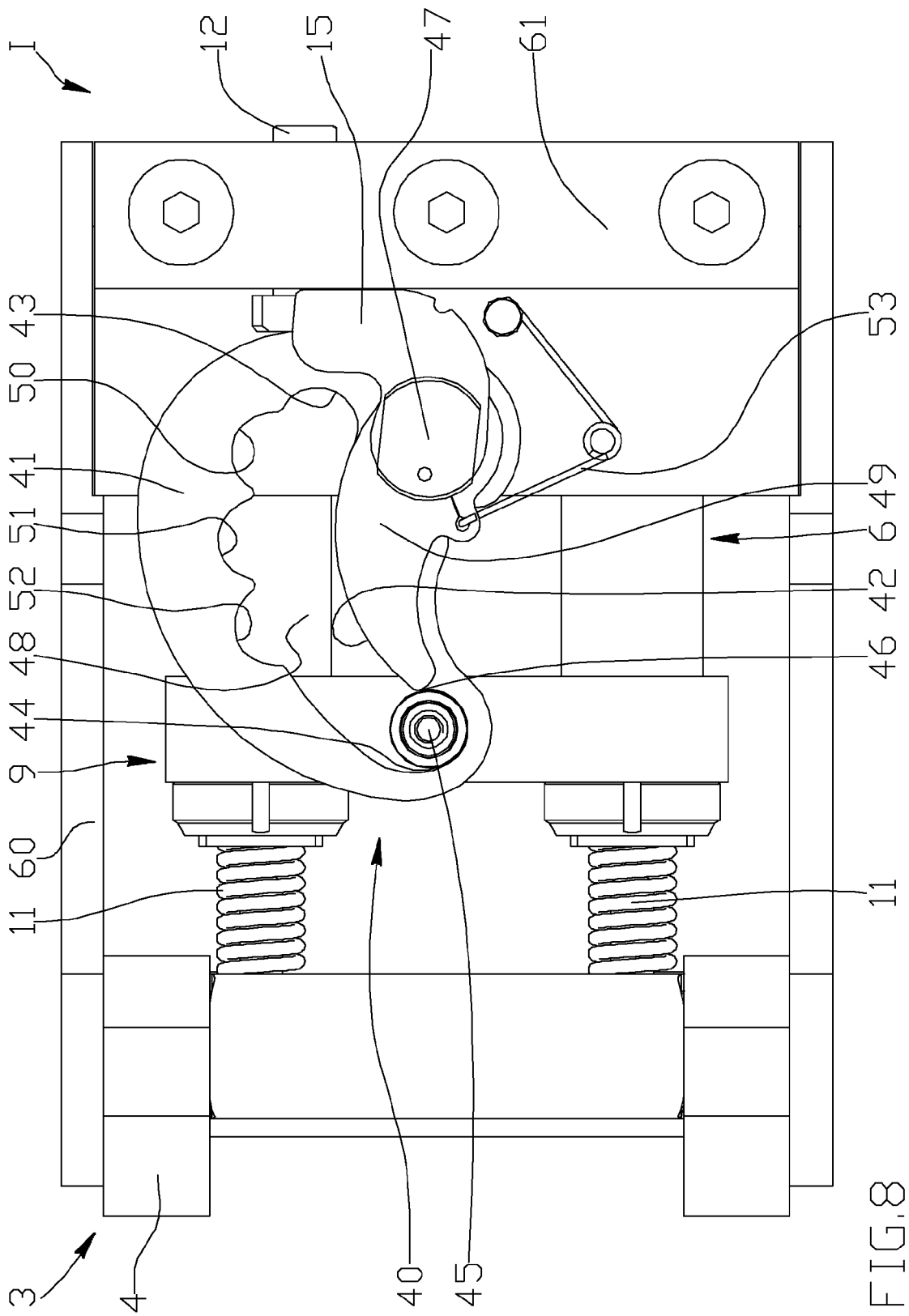


FIG. 7



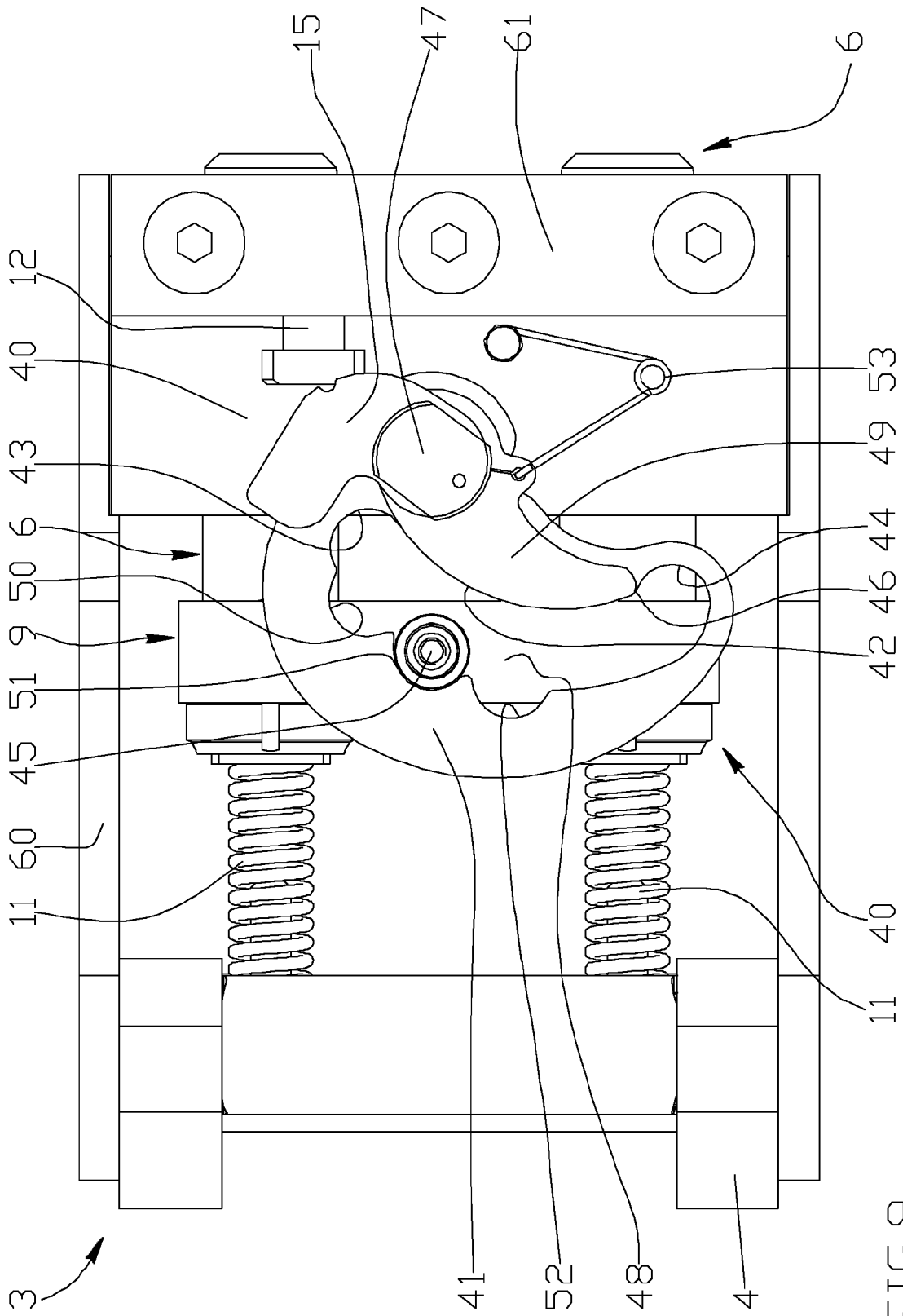


FIG. 9