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(54) POWER TOOLS CONTAINING LOCKING MECHANISMS AND METHOD OF ENGAGING SUCH LOCKING MECHANISMS

ELEKTROWERKZEUGE MIT VERRIEGELUNGSMECHANISMEN UND VERFAHREN ZUM EINRASTEN SOLCHER VERRIEGELUNGSMECHANISMEN

OUTILS ÉLECTRIQUES CONTENANT DES MÉCANISMES DE VERROUILLAGE ET PROCÉDÉ DE MISE EN PRISE DE TELS MÉCANISMES DE VERROUILLAGE

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to power tools, and more specifically to powered fastener drivers.

BACKGROUND OF THE INVENTION

[0002] There are various fastener drivers known in the art for driving fasteners (e.g., nails, tacks, staples, etc.) into a workpiece. These fastener drivers operate utilizing various means known in the art (e.g., compressed air generated by an air compressor, electrical energy, flywheel mechanisms), but often these designs uses simple locking mechanisms for preventing accidental operations of the trigger and thus unwanted and often dangerous fastener propulsion. Such simple locking mechanisms often are not reliable over time, as they are easy to wear out and result in malfunctioning of the locking mechanism.According to its abstract, WO-A-2014/011508 describes a fastener-driving tool including a combustion power source configured for powering a driver blade drive system for reciprocal movement of a driver blade relative to a workpiece. The driver blade drive system includes a first portion configured such that the combustion power source linearly drives a driver blade towards the workpiece, and a second portion configured such that the driver blade is rotated relative to the workpiece.

SUMMARY OF THE INVENTION

[0003] The invention provides, in one aspect, a power tool for driving a fastener including a cylinder; a drive piston within the cylinder, the drive piston being acted on by a driving force resulting from a pressure difference, the drive piston being moveable between an initial position and a driving position; a drive blade coupled to the drive piston and operable to drive a fastener; wherein the power tool includes a locking mechanism that operates through engagement between at least two catches and at least two locking members.

[0004] Preferably, the at least two catches are at least two notches which are integrally formed on the drive blade.

[0005] In one implementation, one of the at least two notches including a ramp.

[0006] In a further aspect of this-implementation, the at least two notches are formed on a side of the drive blade.

[0007] Preferably, the at least two locking members are at least two pins which are mounted with a holder which is separated from the drive blade.

[0008] In one implementation, the pins have a circular or an ellipsoidal cross section.

[0009] In a further aspect of this implementation, the engagement between the at least two pins and the at least two notches are dependent on the holder's location.

[0010] In another implementation, the holder is biased by a resiliently deformable member, which is mounted between a tab portion of the holder and a structural portion of the power tool.

[0011] In yet another implementation, the holder is pivotable between a locking position and an unlocking position.

[0012] In a further implementation, the holder pivots in a first direction that the at least two pins move away from the at least two notches when the holder's tab is pressed by a trip member.

[0013] In yet a further implementation, the holder pivots in a second direction that the at least two pins move closer to the at least two notches when the holder's tab is separated from the trip member.

[0014] In a further aspect of this implementation, the at least two pins disengages from the at least two notches when the holder pivots in the first direction,

[0015] In another aspect of this implementation, the at least two pins attempt to engage the at least two notches when the holder pivots in the second direction.

[0016] In yet another aspect of this implementation, a first one of the at least two pins will engage with the at least two notches and the second one of the at least two pins will only engage with one of the at least two notches.

[0017] The invention provides, in another aspect, a method for engagement of a locking mechanism which including urging a drive blade locked by a locking mechanism to a driving position so as to drive a fastener; urging a holder to a first direction and moving at least two locking members away from at least two catches for disengaging the locking mechanism so that the drive blade can be operated for driving a fastener.

[0018] Preferably, the at least two locking members are at least two pins which are mounted with a holder which is separated from the drive blade.

[0019] Preferably, the at least two locking members are at least two pins which are mounted with a holder which is separated from the drive blade.

[0020] In one implementation, oone of the at least two notches including a ramp.

[0021] Preferably, the pins have a circular or an ellipsoidal cross section.

[0022] The invention provides, in yet another aspect, A method for engagement of a locking mechanism which including urging a drive blade to an initial position so as to engage a locking mechanism; urging a holder to a second direction; moving the at least two locking members closer to the at least two catches so that during the drive blade's return travel, at least one of the locking members is in contact with one of the at least two catches on the drive blade and positioning the at least two locking members with a respective catch for engaging the locking mechanism.

[0023] Preferably, the at least two locking members are at least two pins which are mounted with a holder which is separated from the drive blade.

[0024] Preferably, the at least two catches are at least

two notches which are integrally formed on the drive blade.

[0025] In one implementation, one of the at least two notches including a ramp.

[0026] In another implementation, the pins have a circular or an ellipsoidal cross section.

[0027] In yet another implementation, the method including altering the holder's position so as to control engagement between the pins and the notches.

[0028] In a further implementation, the method for engagement of the locking mechanism which including engaging at least two locking members with a respective catch so as to lock the drive blade to prevent accidental movement of the drive blade; engaging a first locking member with a first notch then shifting the first locking member out of the first notch from the ramp; engaging the first locking member with a second notch whilst engaging a second locking member with the first notch so as complete the locking mechanism engagement.

[0029] Other aspects of the invention will become apparent by consideration of the detailed description and accompanying drawings.

[0030] The current invention including a locking mechanism that can securely restrict the movement of the drive blade for preventing unintended driving of fasteners. By using a multitude of engagement points for the locking mechanism, the longevity of this locking mechanism is therefore greatly improved from the convention locking mechanism where generally only one engagement point is used for locking. As there are at least two locking members and at least two catches being formed and configured to function as the locking mechanism, the force being exerted onto the locking members are practically halved which would result in more than doubling of each locking member's durability. Both pins are now working well under their critical yield strength so the chance of these pins failing has been greatly reduced. Also, the double action pin/notch mechanism makes an additional safety measure, that in case of one of the pins is broken there is still another pin which can at least provide temporary locking function to the blade in the operation.

[0031] Before any embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the following drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032]

FIG. 1 is a perspective view of a powered fastener driver in accordance with an embodiment of the invention.

FIG. 2 is a partial cutaway view of the powered fastener driver of FIG. 1 with a cylinder shown in phantom.

FIG. 3 is a cross-sectional view of a locking mechanism of the powered fastener driver of FIG. 1.

FIG. 4 is a perspective view a holder of the locking mechanism of FIG. 3.

FIG. 5 is a cross-sectional view of the holder in a locking position of the locking mechanism of FIG. 3.

FIG. 6 is a top view of the holder of FIG. 4 moving in a first direction towards an unlocking position.

FIG. 7 is a top view of a striking pin of FIG. 4 in a driving position.

FIG. 8 is a top view of the striking pin of FIG. 4 returning to an initial position.

FIG. 9 is a top view of the holder of FIG. 4 moving in a second direction towards a locking position.

FIG. 10 is a top view of the holder of FIG. 4 moving towards a locking position.

FIG. 11 is a top view of the striking pin of FIG. 4 in an initial position being locked by the locking mechanism.

DETAILED DESCRIPTION

[0033] Fig. 1 illustrates a vacuum powered fastener driver 10 operable to drive fasteners such as nails, tacks, staples and etc. held within a magazine 14 into a work piece. The fastener driver 10 includes an outer housing 18 with a handle portion 22, and a user-actuated trigger 26 mounted on the handle portion 22. The fastener driver 10 does not require an external source of air pressure, but rather includes an on-board vacuum system 30 as shown in Fig.2. The vacuum system 30 is powered by a power source such as a battery pack 34, which is coupled to a battery attachment portion 38 of the outer housing 18. In alternative embodiments, alternative power sources such as an electrical cord may be used to provide power to the vacuum system 30.

[0034] With reference to Fig.1, the fastener driver includes a drive blade 42 actuated by the vacuum system 30 to drive the fasteners into a work piece. The vacuum system 30 includes a variable-volume vacuum chamber 46 defined within a cylinder 50, between a drive piston 54 and an elevator or a reciprocating piston 58.the drive blade 42 is coupled to the drive piston 54, and the vacuum chamber 46 creates a driving force as a result of differential pressure acting on the drive piston 54. The reciprocating piston 58 is driven in a reciprocating manner by a drive assembly that is not shown. In the illustrated embodiment of the fastener driver 10, the drive assembly includes a motor 74, a transmission that receives torque from the motor 74, a pinion 66 and connected to the drive piston 54 for reciprocation therewith.

[0035] With reference to Fig.2, a vacuum is developed within the vacuum chamber 46 by moving the reciprocating piston 58 away from the drive piston 54, while the position of the drive piston 54 is held or maintained. A bumper 76 is positioned in a bottom portion of the cylinder 50 and absorbs impact forces from the reciprocating pis-

ton 58 and drive piston 54. The bumper 76 includes projections 77 that are received in corresponding recesses (not shown) formed in the reciprocating piston 58.

[0036] In order to ensure the operational safety of the fastener driver 10, a locking mechanism is designed and implemented. With reference to Fig,3, the locking mechanism 300 includes a holder 302 which further includes a plurality of components that are designed to work in tandem with the drive blade's shaft portion 301 so as to provide a locking function for preventing accidental actuation of the fastener driver 10. The holder 302 pivots about an axle 310, which is configured in a fixed portion near the front end of the fastener driver 10, The holder 302 is further connected with the same fixed portion by a resiliently deformable member 314 that is disposed between the fixed portion and a finger 312 on the holder 302. In this embodiment, a spring 314 is used for providing a biasing force so as to urge the holder in a first direction. The holder 302 may include a plurality of locking members and in this embodiment, the holder 302 includes two locking members 304, 305 in the form of a pin, which are designed to interact with catches formed on the drive blade's shaft portion 301. The holder 302 also has a tab portion 318 for being engaged with a trip portion 316 from the reciprocating piston 58 for urging the holder 302 into a second direction.

[0037] The locking mechanism 300 relies on the automatic engagement between the pins 304, 305 on the holder 302 and the catches 306, 308 which are integrally formed on the drive blade 42.The pins 304, 305 may have circular cross sections or in some instances ellipsoidal cross sections. The pins 304, 305 are made of a high strength material or preferably an alloy that has high resistance to impact loading and fatigue. Also, the material used should also have high ductility so as to allow the user some leeway for noticing the conditions of the pins 304, 305 from the positioning of the drive blade 42 in the initial position. Brittle materials should be avoided as snapping of the pins 304, 305 would allow fasteners to be driven accidentally and thus becoming a hazard to the user.

[0038] The pins 304, 305 are designed to engage with the catches that are integrally formed on the drive blade 42. The catches in this embodiment are two notches formed serially along the drive blade's longitudinal direction. The two notches is consisting of a first notch 306 and a second notch 308. The first notch 306 is different to the second notch 308 in a way that the first notch includes a slanted edge, which is a ramp 307 in this embodiment as shown in Fig.3. The second notch 308 only has a symmetrically formed profile. The two notches are spaced apart from each other and the ramp 307 forms a smooth transition between the first notch 306 and the second notch 308.

[0039] Now turning to the operation of the device described above, Fig.4 shows the locking mechanism 300 in a locking position whilst the drive blade 42 is in an initial position. The holder 302 is urged by a spring (not shown) and the result is that the two pins 304, 305 are fully engaged with the first and second notches 306, 308. In the initial position, the longitudinal movement of the drive blade 42 along its longitudinal axis is fully restricted by the locking mechanism 300 so that maximum safety is ensured. With reference to Fig.5, the cross-sectional view of the locking mechanism 300 reveals that each pin 304,305 is engaged with a respective notch and the pins 304, 305 are urged by the spring (not shown) through the holder 302 toward a locking position for restricting the movement of the drive blade 42.

[0040] In order to utilize the locking mechanism as shown in Figs. 6-11 for driving a fastener into a work piece, a user actuates the trigger (not shown) of the fastener driver for powering of the motor. Actuation of the trigger will cause the reciprocating piston to move toward the holder and allowing the trip portion on the reciprocating piston to engage the tab portion 318 on the holder 302. The holder 302 will be urged to a first direction, which in this embodiment is the anti-clockwise direction. The movement of the holder 302 will also cause the at least two locking members moving away from the at least two catches and therefore derestricting the movement of the drive blade 42. Fig.7 shows a drive blade 42 to be in its driving position for driving a fastener. As the figure shown, the at least two catches are well beyond the at least two locking members on the holder 302.

[0041] Once the drive blade 42 has driven a fastener into a work piece, in this embodiment the reciprocating piston will move in the direction of the drive blade's initial position and therefore causing the trip portion on the reciprocating piston to disengage from the tab portion 318 of the holder 302. Such disengagement will also rid of any biasing force acted on the tab portion 318 of the holder 302. Accordingly, the holder 302 in this embodiment will be urged in a second direction, which is the clockwise direction so as to move the at least two locking members in the direction of the drive blade 42. The first locking member 305 will be caught by the first catch 306 as shown in Fig.8 during the return of the drive blade 42 toward its initial position. However, as shown in Figs.9-10, the locking member being caught by the first catch 306 will then be slid out of the first catch 306 along a ramp 307 that is formed between the first catch 306 and the second catch 308. The locking member will then slide towards to the second catch 308 as the drive blade continues returning to its initial position.

[0042] Once the drive blade 42 has completed returning to its initial position as shown in Fig.11, both of the locking members 304 engage with a respective first and second catch 306,308 and completing the locking function of the locking mechanism 300. As Fig.11 shown, the two locking members 304,305 are both being urged toward the longitudinal edge of the catches 306,308 to ensure that the drive blade 42 would be securely restricted for preventing any accidental movement.

[0043] In another embodiment that is not shown in the figures, another fastener driver may have a locking mech-

anism that includes more than two locking members and more than two catches. The locking members and the catches will be similarly formed as the embodiment in Figs.3-11 as in the locking members will also be pins that have either a circular cross-section profile or an ellipsoidal cross-section profile. The catches would also be integrally formed on the drive blade except that there will be at least two ramps being formed should there be three catches.

Claims

1. A power tool (10) for driving a fastener including:

a cylinder (50);
a drive piston (54) within the cylinder, the drive piston acted on by a driving force resulting from a pressure difference, the drive piston moveable between an initial position and a driving position;
a drive blade (42) coupled to the drive piston and operable to drive a fastener;
wherein the power tool comprises a locking mechanism (300) that operates through engagement between at least two catches (306, 308) and at least two locking members (304, 305), **characterized in that** the at least two catches are formed serially on the drive blade along the drive blade's longitudinal direction.

2. The power tool (10) of claim 1, wherein the at least two catches (306, 308) are at least two notches (306, 308) which are integrally formed on the drive blade (42),
and optionally wherein one of the at least two notches comprises a ramp (307),
and further optionally wherein the at least two notches are formed on a side of the drive blade.

3. The power tool (10) of claim 1, wherein the at least two locking members (304, 305) are at least two pins (304, 305) which are mounted with a holder (302) which is separated from the drive blade (42),
and optionally wherein the pins have a circular or an ellipsoidal cross section,
and/or wherein the engagement between the at least two pins and the at least two notches are dependent on the holder's location.

4. The power tool (10) of claim 3,

wherein the holder (302) is biased by a resiliently deformable member, which is mounted between a tab portion (318) of the holder and a structural portion of the power tool,
or
wherein the holder is pivotable between a locking position and an unlocking position,
or
wherein the holder pivots in a first direction that the at least two pins (304, 305) move away from the at least two notches (306, 308) when the holder's tab is pressed by a trip member (316).

5. The power tool (10) of claim 3, wherein the holder (302) pivots in a second direction that the at least two pins (304, 305) move closer to the at least two notches (306, 308) when the holder's tab (318) is separated from the trip member (316),
and optionally

wherein the at least two pins disengages from the at least two notches when the holder pivots in the first direction,
or
wherein the at least two pins attempt to engage the at least two notches when the holder pivots in the second direction,
and optionally wherein a first one of the at least two pins will engage with the at least two notches and the second one of the at least two pins will only engage with one of the at least two notches.

6. A method for engagement of a locking mechanism (300), including:

urging a drive blade (42) locked by a locking mechanism to a driving position (54) so as to drive a fastener;
urging a holder (302) to a first direction and **characterized by** moving at least two locking members (304, 305) away from at least two catches (306, 308) for disengaging the locking mechanism so that the drive blade can be operated for driving a fastener, the at least two catches formed serially on the drive blade along the drive blade's longitudinal direction.

7. The method for engagement of the locking mechanism (300) of claim 6,

wherein the at least two locking members (304, 305) are at least two pins (304, 305) which are mounted with a holder (302) which is separated from the drive blade (42),
or
wherein the at least two catches (306, 308) are at least two notches (306, 308) which are integrally formed on the drive blade, and optionally wherein one of the at least two notches includes a ramp (307).

8. The method for engagement of the locking mechanism (300) of claim 6, wherein the pins (304, 305) have a circular or an ellipsoidal cross section.

9. A method for engagement of a locking mechanism (300), including:

urging a drive blade (42) to an initial position so as to engage a locking mechanism;
urging a holder (302) to a second direction;
moving the at least two locking members (304, 305) closer to the at least two catches (306, 308) so that during the drive blade's return travel, at least one of the locking members is in contact with one of the at least two catches on the drive blade and **characterized by**
positioning the at least two locking members with a respective catch for engaging the locking mechanism, the at least two catches formed serially on the drive blade along the drive blade's longitudinal direction.

10. The method for engagement of the locking mechanism (300) of claim 9, wherein the at least two locking members (304, 305) are at least two pins (304, 305) which are mounted with a holder (302) which is separated from the drive blade (42).

11. The method for engagement of the locking mechanism (300) of claim 9, wherein the at least two catches (306, 308) are at least two notches (306, 308) which are integrally formed on the drive blade (42).

12. The method for engagement of the locking mechanism (300) of claim 11, wherein one of the at least two notches (306, 308) includes a ramp (307).

13. The method for engagement of the locking mechanism (300) of claim 9, wherein the pins (304, 305) have a circular or an ellipsoidal cross section.

14. The method for engagement of the locking mechanism (300) of claims 6 or 9, wherein the method includes altering the holder's position so as to control engagement between the pins (304, 305) and the notches (306, 308).

15. The method for engagement of the locking mechanism (300) of claim 12, further comprising:

engaging at least two locking members (304, 305) with a respective catch so as to lock the drive blade to prevent accidental movement of the drive blade (42);
engaging a first locking member with a first notch then shifting the first locking member out of the first notch from the ramp (307); and
engaging the first locking member with a second notch whilst engaging a second locking member with the first notch so as complete the locking mechanism engagement.

Patentansprüche

1. Elektrowerkzeug (10) zum Antreiben eines Befestigungselements, einschließlich:

eines Zylinders (50);
eines Antriebskolbens (54) innerhalb des Zylinders, wobei auf den Antriebskolben durch eine Antriebskraft eingewirkt wird, die aus einer Druckdifferenz resultiert, wobei der Antriebskolben zwischen einer Ausgangsposition und einer Antriebsposition beweglich ist;
einer Antriebsschiene (42), die mit dem Antriebskolben gekoppelt ist und betreibbar ist, um ein Befestigungselement anzutreiben;
wobei das Elektrowerkzeug einen Verriegelungsmechanismus (300) umfasst, der durch Eingriff zwischen mindestens zwei Kerben (306, 308) und mindestens zwei Verriegelungselementen (304, 305) betätigt wird, **dadurch gekennzeichnet, dass** die mindestens zwei Kerben in Reihe an der Antriebsschiene entlang der Längsrichtung der Antriebsschiene ausgebildet sind.

2. Elektrowerkzeug (10) nach Anspruch 1, wobei die mindestens zwei Kerben (306, 308) mindestens zwei Kerben (306, 308) sind, die als integraler Bestandteil an der Antriebsschiene (42) ausgebildet sind,

und wobei optional eine der mindestens zwei Kerben eine Rampe (307) umfasst,
und wobei ferner optional die mindestens zwei Kerben auf einer Seite der Antriebsschiene ausgebildet sind.

3. Elektrowerkzeug (10) nach Anspruch 1, wobei die mindestens zwei Verriegelungselemente (304, 305) mindestens zwei Stifte (304, 305) sind, welche mit einer Halterung (302) montiert sind, die von der Antriebsschiene (42) getrennt ist,

und wobei optional die Stifte einen kreisförmigen oder einen ellipsoiden Querschnitt aufweisen,
und/oder wobei der Eingriff zwischen den mindestens zwei Stiften und den mindestens zwei Kerben von der Position der Halterung abhängig ist.

4. Elektrowerkzeug (10) nach Anspruch 3,

wobei die Halterung (302) durch ein elastisch verformbares Element vorgespannt ist, das zwischen einem Laschenabschnitt (318) der Halterung und einem Strukturabschnitt des Elektrowerkzeugs montiert ist,

oder
wobei die Halterung zwischen einer Verriegelungsposition und einer Entriegelungsposition schwenkbar ist,
oder
wobei die Halterung in einer ersten Richtung schwenkt, so dass die mindestens zwei Stifte (304, 305) sich von den mindestens zwei Kerben (306, 308) wegbewegen, wenn die Lasche der Halterung durch ein Auslöseelement (316) gedrückt wird.

5. Elektrowerkzeug (10) nach Anspruch 3, wobei die Halterung (302) in einer zweiten Richtung schwenkt, so dass die mindestens zwei Stifte (304, 305) sich auf die mindestens zwei Kerben (306, 308) zubewegen, wenn die Halterung (318) von dem Auslöseelement (316) getrennt wird,
und wobei optional

die mindestens zwei Stifte von den mindestens zwei Kerben auskuppeln, wenn die Halterung in der ersten Richtung schwenkt,
oder
wobei die mindestens zwei Stifte versuchen, die mindestens zwei Kerben in Eingriff zu nehmen, wenn die Halterung in der zweiten Richtung schwenkt,
und wobei optional ein erster der mindestens zwei Stifte in die mindestens zwei Kerben eingreift und der zweite der mindestens zwei Stifte nur in eine der mindestens zwei Kerben eingreift.

6. Verfahren zum Eingriff eines Verriegelungsmechanismus (300), einschließlich:

Drücken einer Antriebsschiene (42), die durch einen Verriegelungsmechanismus verriegelt ist, in eine Antriebsposition (54), um ein Befestigungselement anzutreiben;
Drücken einer Halterung (302) in einer ersten Richtung und
gekennzeichnet durch
Wegbewegen mindestens zweier Verriegelungselemente (304, 305) aus mindestens zwei Kerben (306, 308) zum Lösen des Verriegelungsmechanismus, so dass die Antriebsschiene zum Antreiben eines Befestigungselements betätigt werden kann, wobei die mindestens zwei Kerben in Reihe an der Antriebsschiene entlang der Längsrichtung der Antriebsschiene ausgebildet sind.

7. Verfahren zum Eingriff des Verriegelungsmechanismus (300) nach Anspruch 6,

wobei die mindestens zwei Verriegelungselemente (304, 305) mindestens zwei Stifte (304, 305) sind, die mit einer Halterung (302) montiert sind, die von der Antriebsschiene (42) getrennt ist,
oder
wobei die mindestens zwei Kerben (306, 308) mindestens zwei Kerben (306, 308) sind, die als integraler Bestandteil an der Antriebsschiene ausgebildet sind, und wobei optional eine der mindestens zwei Kerben eine Rampe (307) einschließt.

8. Verfahren zum Eingriff des Verriegelungsmechanismus (300) nach Anspruch 6, wobei die Stifte (304, 305) einen kreisförmigen oder einen ellipsoiden Querschnitt aufweisen.

9. Verfahren zum Eingriff eines Verriegelungsmechanismus (300), einschließlich:

Drücken einer Antriebsschiene (42) in eine Ausgangsposition, um einen Verriegelungsmechanismus in Eingriff zu bringen;
Drücken einer Halterung (302) in einer zweiten Richtung;
Heranbewegen der mindestens zwei Verriegelungselemente (304, 305) an die mindestens zwei Kerben (306, 308), so dass während des Rücklaufs der Antriebsschiene mindestens eines der Verriegelungselemente mit einer der mindestens zwei Kerben an der Antriebsschiene in Kontakt steht, und **gekennzeichnet durch**
Positionieren der mindestens zwei Verriegelungselemente mit einer jeweiligen Kerbe zum Eingreifen des Verriegelungsmechanismus, wobei die mindestens zwei Kerben in Reihe an der Antriebsschiene entlang der Längsrichtung der Antriebsschiene ausgebildet sind.

10. Verfahren zum Eingriff des Verriegelungsmechanismus (300) nach Anspruch 9, wobei die mindestens zwei Verriegelungselemente (304, 305) mindestens zwei Stifte (304, 305) sind, die mit einer Halterung (302) montiert sind, die von der Antriebsschiene (42) getrennt ist.

11. Verfahren zum Eingriff des Verriegelungsmechanismus (300) nach Anspruch 9, wobei die mindestens zwei Kerben (306, 308) mindestens zwei Kerben (306, 308) sind, die als integraler Bestandteil an der Antriebsschiene (42) ausgebildet sind.

12. Verfahren zum Eingriff des Verriegelungsmechanismus (300) nach Anspruch 11, wobei eine der mindestens zwei Kerben (306, 308) eine Rampe (307) einschließt.

13. Verfahren zum Eingriff des Verriegelungsmechanis-

mus (300) nach Anspruch 9, wobei die Stifte (304, 305) einen kreisförmigen oder einen ellipsoiden Querschnitt aufweisen.

14. Verfahren zum Eingriff des Verriegelungsmechanismus (300) nach den Ansprüchen 6 oder 9, wobei das Verfahren ein Ändern der Position der Halterung einschließt, um den Eingriff zwischen den Stiften (304, 305) und den Kerben (306, 308) zu steuern.

15. Verfahren zum Eingriff des Verriegelungsmechanismus (300) nach Anspruch 12, ferner umfassend:

Eingreifen von mindestens zwei Verriegelungselementen (304, 305) in eine jeweilige Verriegelung, um die Antriebsschiene zu verriegeln, um eine versehentliche Bewegung der Antriebsschiene (42) zu verhindern;
Eingreifen eines ersten Verriegelungselements in eine erste Kerbe, dann Verschieben des ersten Verriegelungselements aus der ersten Kerbe von der Rampe (307); und
Eingreifen des ersten Verriegelungselements in eine zweite Kerbe, während ein zweites Verriegelungselement in die erste Kerbe eingreift, um den Verriegelungsmechanismus zu verriegeln.

Revendications

1. Outil électrique (10) d'entraînement d'une fixation incluant :

un cylindre (50) ;
un piston d'entraînement (54) au sein du cylindre, le piston d'entraînement soumis à une force d'entraînement résultant d'une différence de pression, le piston d'entraînement déplaçable entre une position initiale et une position d'entraînement ;
une pale d'entraînement (42) couplée au piston d'entraînement et pouvant fonctionner pour entraîner une fixation ;
dans lequel l'outil électrique comprend un mécanisme de verrouillage (300) qui fonctionne par engagement entre au moins deux ergots (306, 308) et au moins deux éléments de verrouillage (304, 305), **caractérisé en ce que** les au moins deux ergots sont formés en série sur la pale d'entraînement le long de la direction longitudinale de la pale d'entraînement.

2. Outil électrique (10) selon la revendication 1, dans lequel les au moins deux ergots (306, 308) sont au moins deux encoches (306, 308) qui sont solidairement formées sur la pale d'entraînement (42),

et éventuellement dans lequel l'une des au moins deux encoches comprend une rampe (307),
et en outre éventuellement dans lequel les au moins deux encoches sont formées sur un côté de la pale d'entraînement.

3. Outil électrique (10) selon la revendication 1, dans lequel les au moins deux éléments de verrouillage (304, 305) sont au moins deux goupilles (304, 305) qui sont montées avec un support (302) qui est séparé de la pale d'entraînement (42),

et éventuellement dans lequel les goupilles ont une section transversale circulaire ou ellipsoïdale,
et/ou dans lequel l'engagement entre les au moins deux goupilles et les au moins deux encoches dépendent de l'emplacement du support.

4. Outil électrique (10) selon la revendication 3,

dans lequel le support (302) est sollicité par un élément élastiquement déformable, qui est monté entre une partie de languette (318) du support et une partie structurelle de l'outil électrique,
ou
dans lequel le support peut pivoter entre une position de verrouillage et une position de déverrouillage,
ou
dans lequel le support pivote dans une première direction telle que les au moins deux goupilles (304, 305) s'éloignent des au moins deux encoches (306, 308) lorsque la languette du support est pressée par un élément de déclenchement (316).

5. Outil électrique (10) selon la revendication 3, dans lequel le support (302) pivote dans une seconde direction telle que les au moins deux goupilles (304, 305) se rapprochent des au moins deux encoches (306, 308) lorsque la languette du support (318) est séparée de l'élément de déclenchement (316),
et éventuellement

dans lequel les au moins deux goupilles se désengagent des au moins deux encoches lorsque le support pivote dans la première direction,
ou
dans lequel les au moins deux goupilles tentent de s'engager dans les au moins deux encoches lorsque le support pivote dans la seconde direction,
et éventuellement dans lequel une première des au moins deux goupilles s'engagera dans les au moins deux encoches et la seconde des au

moins deux goupilles ne s'engagera que dans l'une des au moins deux encoches.

6. Procédé d'engagement d'un mécanisme de verrouillage (300), incluant :

la poussée d'une pale d'entraînement (42) verrouillée par un mécanisme de verrouillage vers une position d'entraînement (54) de manière à entraîner une fixation ;
la poussée d'un support (302) vers une première direction et **caractérisé par**
le déplacement d'au moins deux éléments de verrouillage (304, 305) à l'écart d'au moins deux ergots (306, 308) pour désengager le mécanisme de verrouillage de sorte que la pale d'entraînement peut fonctionner pour entraîner une fixation, les au moins deux ergots formés en série sur la pale d'entraînement le long de la direction longitudinale de la pale d'entraînement.

7. Procédé d'engagement du mécanisme de verrouillage (300) selon la revendication 6,

dans lequel les au moins deux éléments de verrouillage (304, 305) sont au moins deux goupilles (304, 305) qui sont montées avec un support (302) qui est séparé de la pale d'entraînement (42),
ou
dans lequel les au moins deux ergots (306, 308) sont au moins deux encoches (306, 308) qui sont solidairement formées sur la pale d'entraînement, et éventuellement dans lequel l'une des au moins deux encoches inclut une rampe (307).

8. Procédé d'engagement du mécanisme de verrouillage (300) selon la revendication 6, dans lequel les goupilles (304, 305) ont une section transversale circulaire ou ellipsoïdale.

9. Procédé d'engagement d'un mécanisme de verrouillage (300), incluant :

la poussée d'une pale d'entraînement (42) vers une position initiale de manière à s'engager dans un mécanisme de verrouillage ;
la poussée d'un support (302) vers une seconde direction ;
le déplacement des au moins deux éléments de verrouillage (304, 305) plus près des au moins deux ergots (306, 308) de sorte que pendant la course de retour de la pale d'entraînement, au moins l'un des éléments de verrouillage est en contact avec l'un des au moins deux ergots sur la pale d'entraînement et **caractérisé par**
le positionnement des au moins deux éléments de verrouillage avec un ergot respectif pour s'engager dans le mécanisme de verrouillage, les au moins deux ergots formés en série sur la pale d'entraînement le long de la direction longitudinale de la pale d'entraînement.

10. Procédé d'engagement du mécanisme de verrouillage (300) selon la revendication 9, dans lequel les au moins deux éléments de verrouillage (304, 305) sont au moins deux goupilles (304, 305) qui sont montées avec un support (302) qui est séparé de la pale d'entraînement (42).

11. Procédé d'engagement du mécanisme de verrouillage (300) selon la revendication 9, dans lequel les au moins deux ergots (306, 308) sont au moins deux encoches (306, 308) qui sont solidairement formées sur la pale d'entraînement (42).

12. Procédé d'engagement du mécanisme de verrouillage (300) selon la revendication 11, dans lequel l'une des au moins deux encoches (306, 308) inclut une rampe (307).

13. Procédé d'engagement du mécanisme de verrouillage (300) selon la revendication 9, dans lequel les goupilles (304, 305) ont une section transversale circulaire ou ellipsoïdale.

14. Procédé d'engagement du mécanisme de verrouillage (300) selon les revendications 6 ou 9, dans lequel le procédé inclut la modification de la position du support de manière à commander un engagement entre les goupilles (304, 305) et les encoches (306, 308).

15. Procédé d'engagement du mécanisme de verrouillage (300) selon la revendication 12, comprenant en outre :

l'engagement d'au moins deux éléments de verrouillage (304, 305) dans un ergot respectif de manière à verrouiller la pale d'entraînement pour empêcher un déplacement accidentel de la pale d'entraînement (42) ;
l'engagement d'un premier élément de verrouillage dans une première encoche puis le retrait du premier élément de verrouillage de la première encoche de la rampe (307) ; et
l'engagement du premier élément de verrouillage dans une seconde encoche tout en engageant un second élément de verrouillage dans la première encoche de manière à terminer l'engagement du mécanisme de verrouillage.

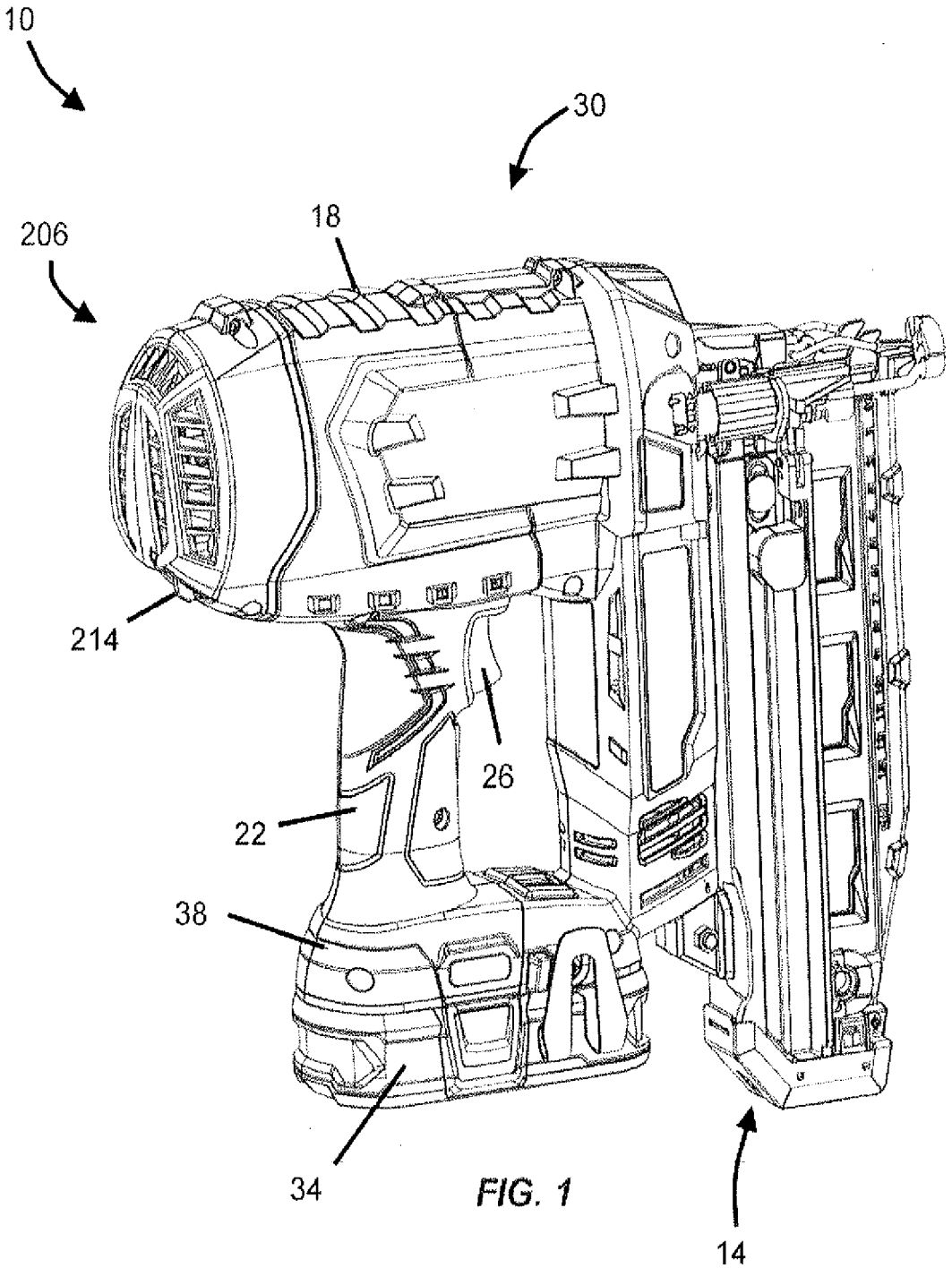

FIG. 1

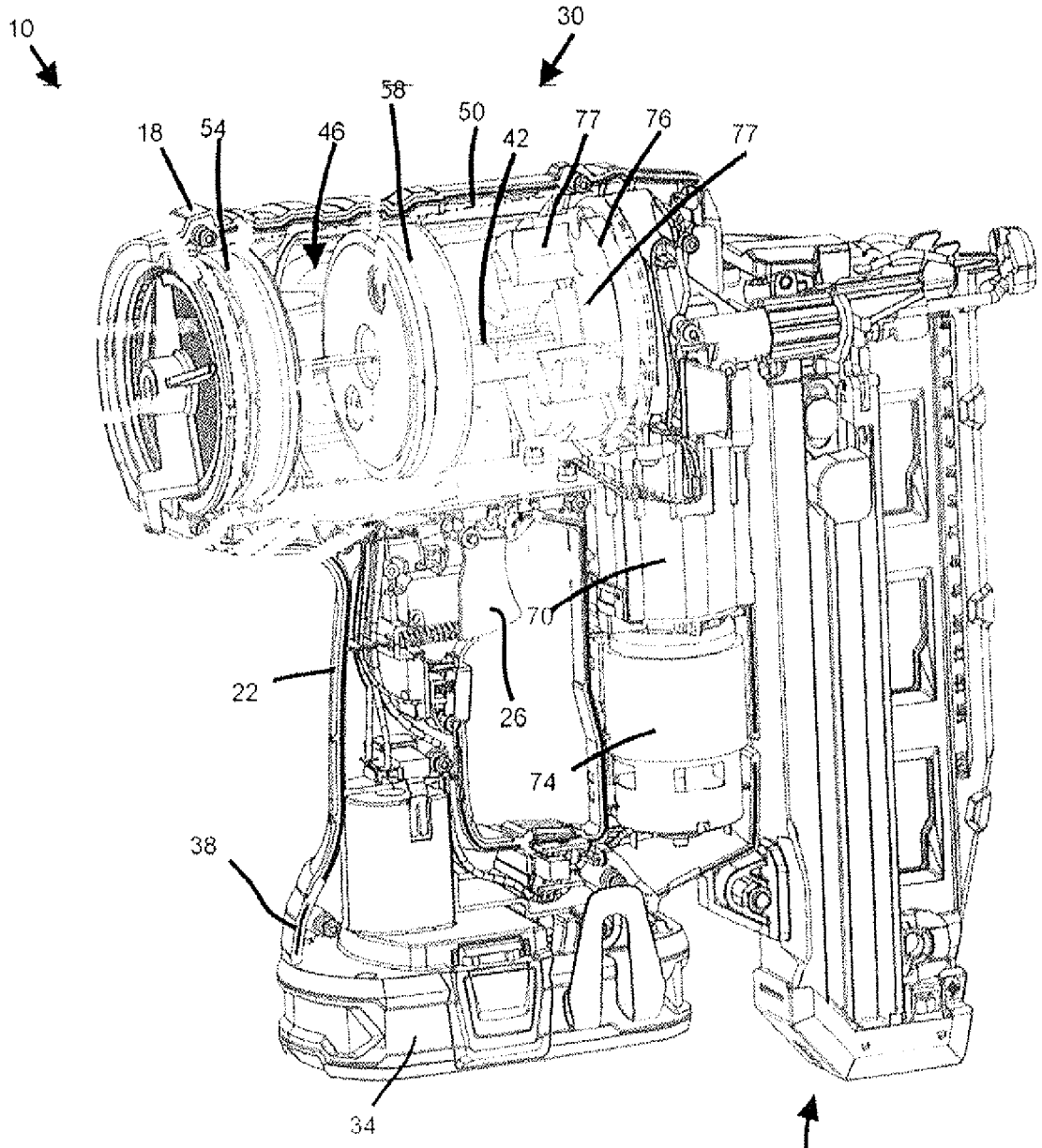

FIG. 2

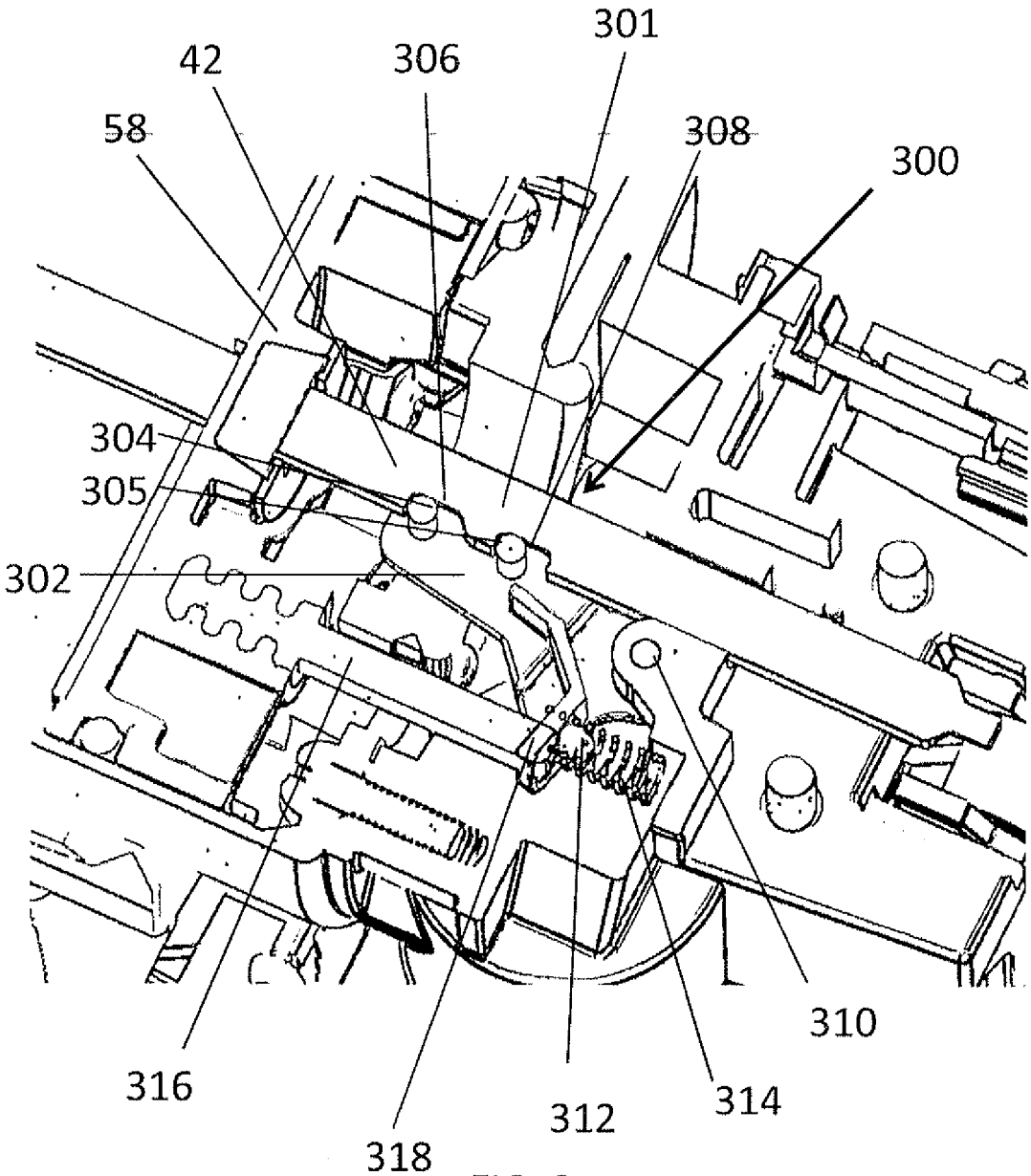

FIG. 3

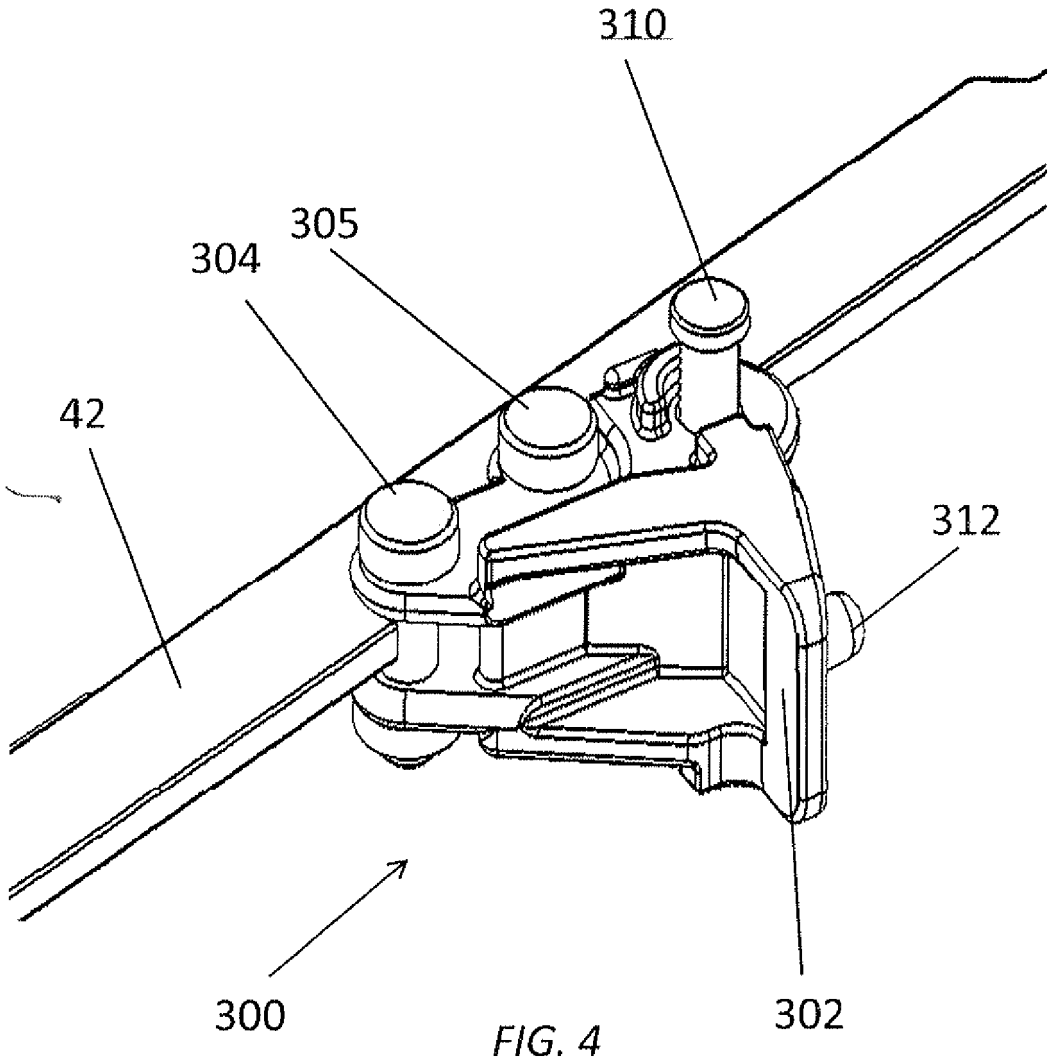

FIG. 4

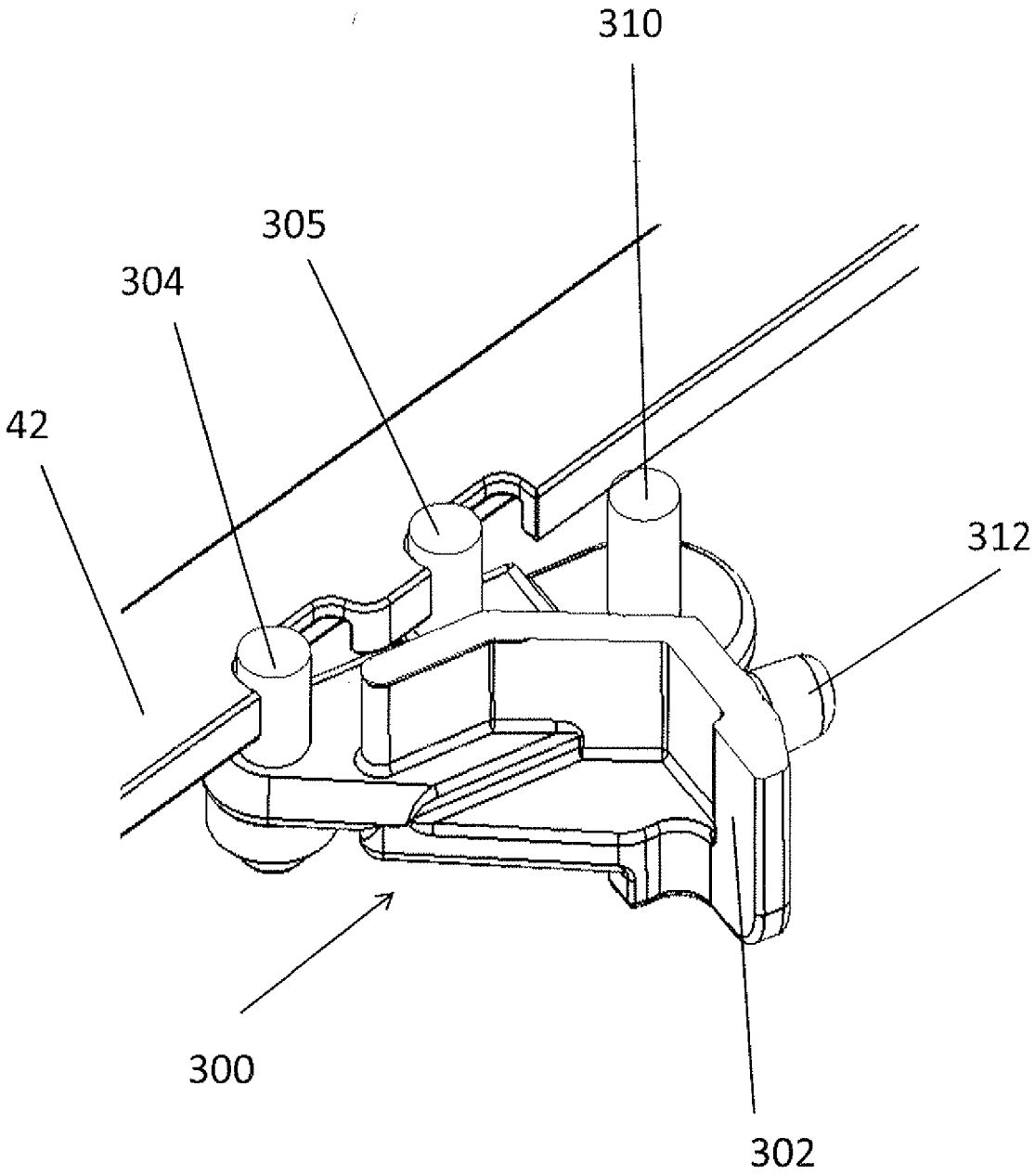

FIG. 5

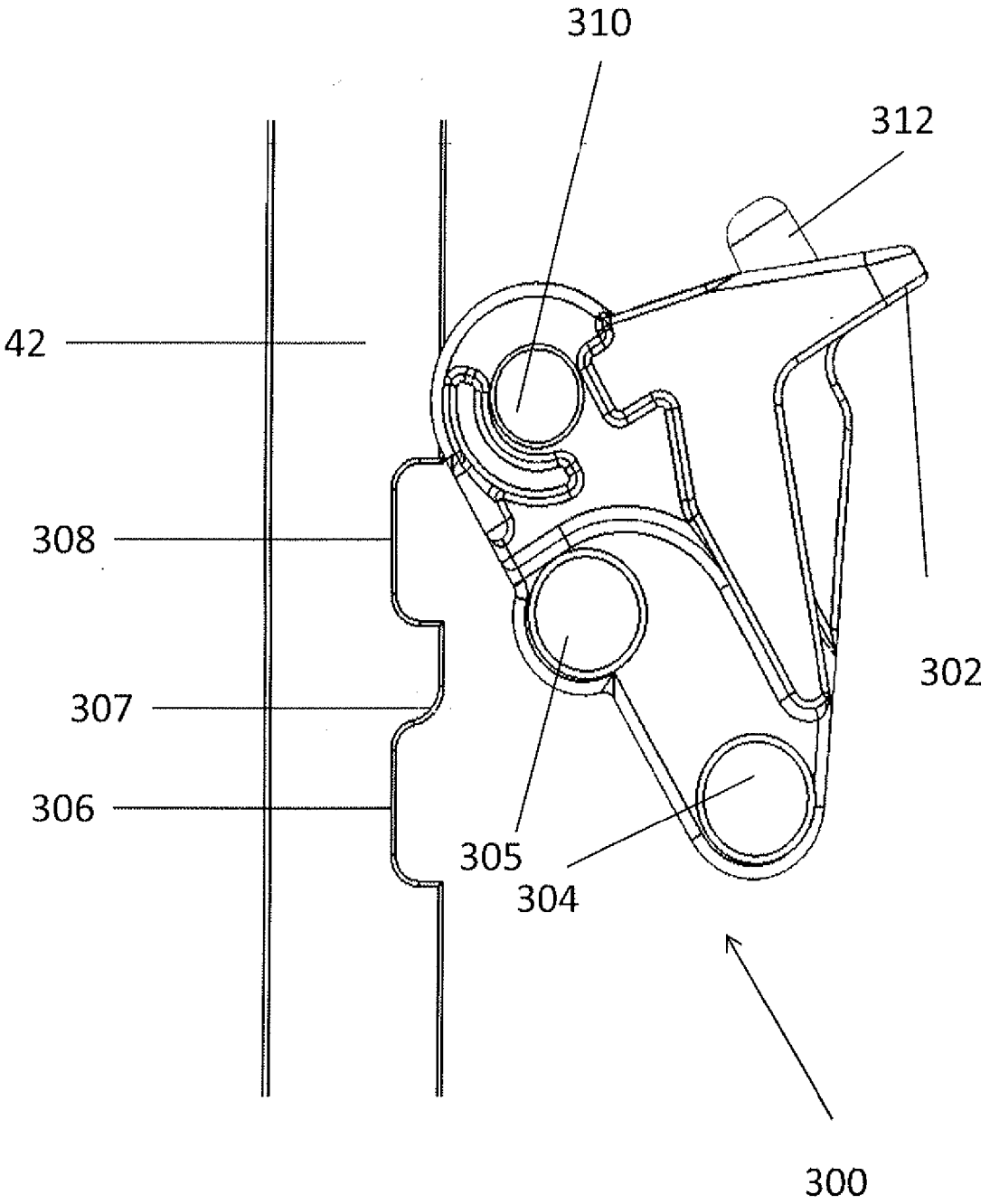

FIG. 6

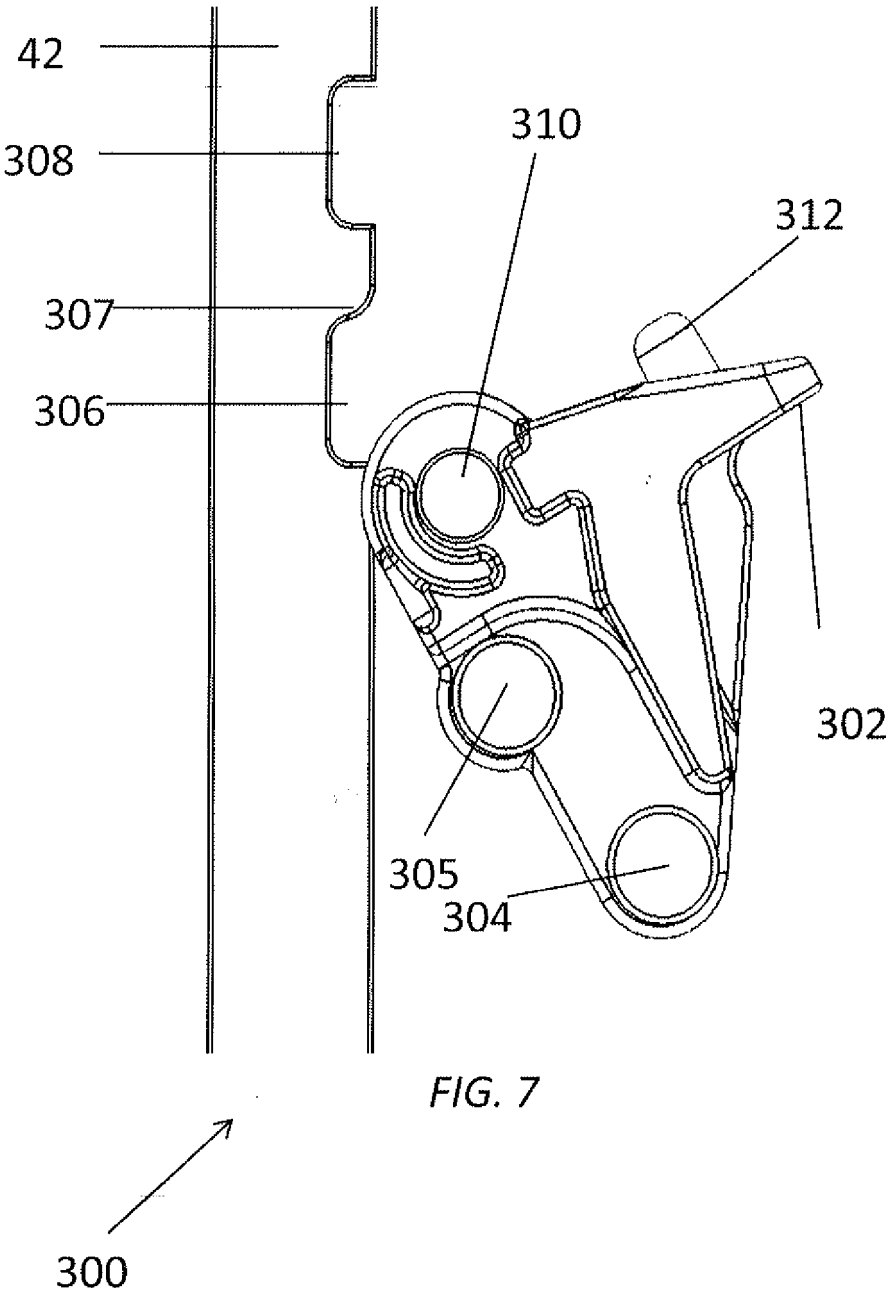

FIG. 7

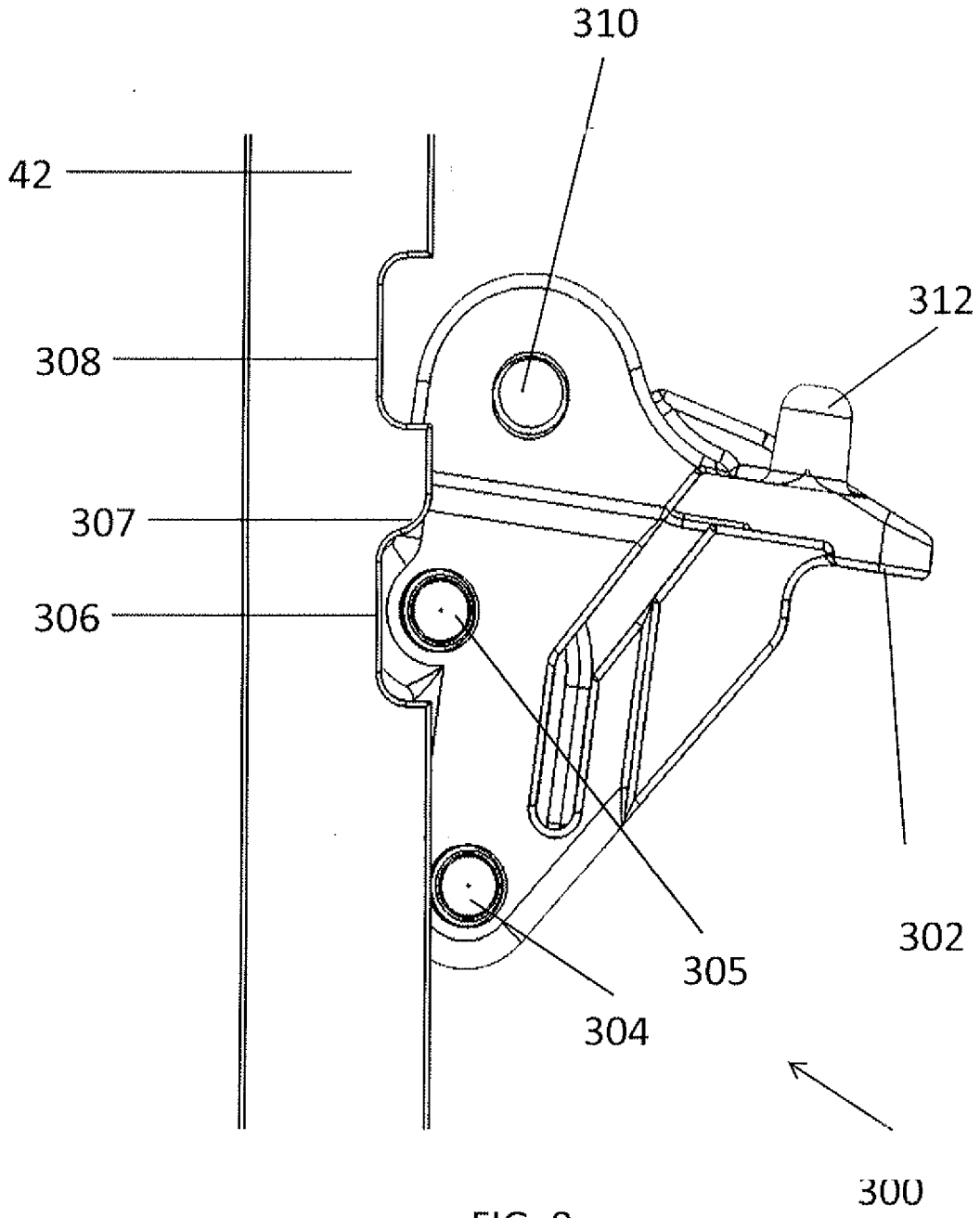

FIG. 8

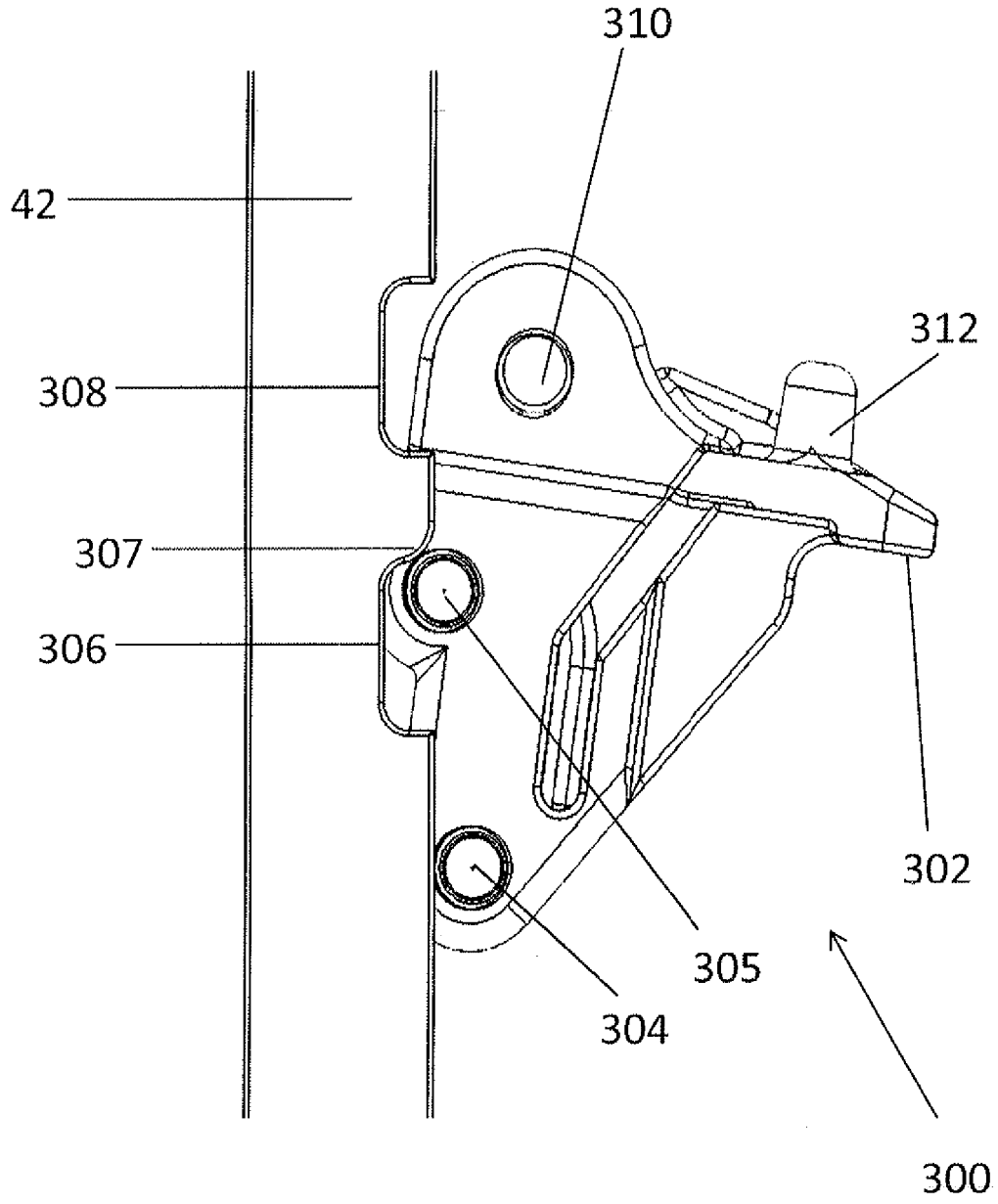

FIG. 9

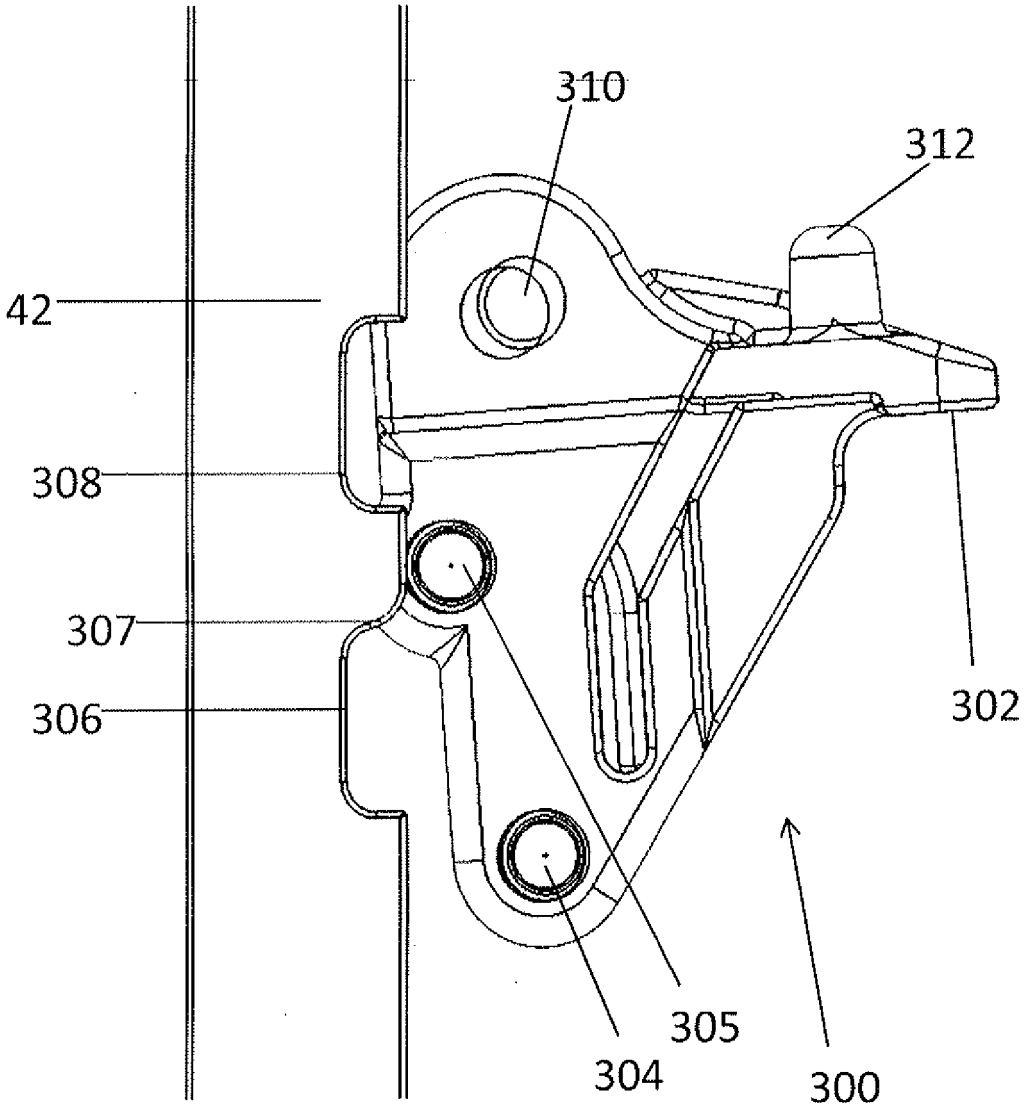

FIG. 10

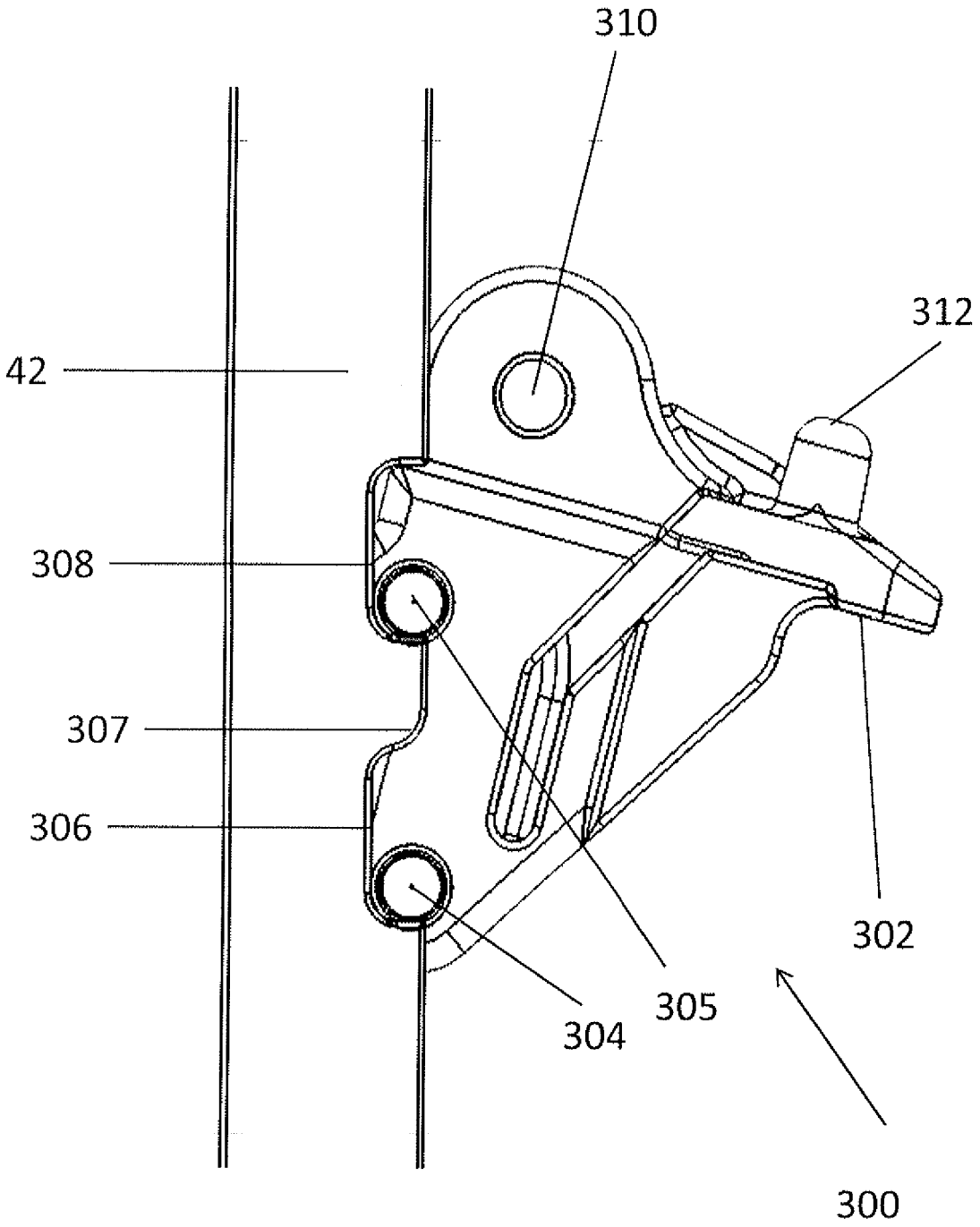

FIG. 11

REFERENCES CITED IN THE DESCRIPTION

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