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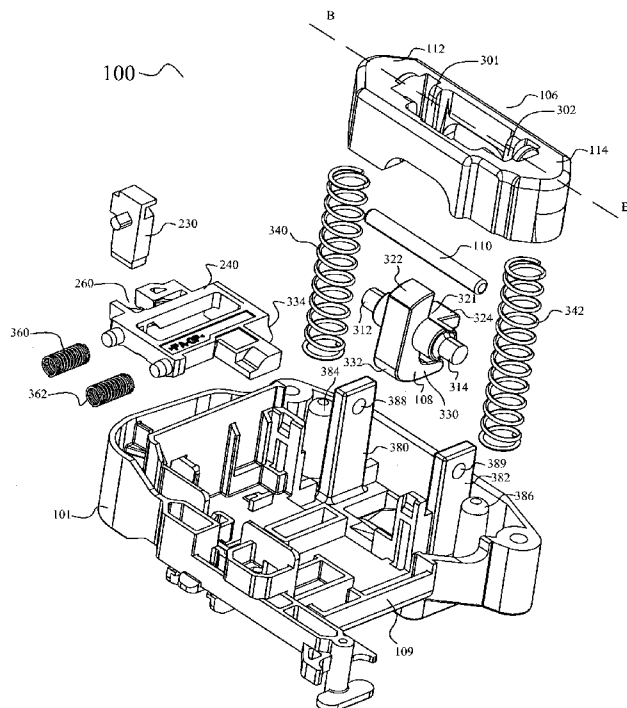
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(54) Title: AN ELECTROMAGNETIC DOOR LOCK

Fig. 3



(57) Abstract: Disclosed is an electromagnetic door lock comprising: a door lock case which has a base portion, a mounting bracket being provided on the door lock case, the mounting bracket being movable up and down or to and fro relative to the base portion of the door lock case, the mounting bracket being oppositely provided with two ends in a lengthwise direction thereof, and mounting slots being provided oppositely on the two ends; and a cam, from whose both sides camshafts extend out, the camshafts being respectively mounted in the mounting slots at the ends of the mounting bracket, a door lock hook being provided in the middle of the cam to receive a door hook, an upper portion of the cam being provided with a step.



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AN ELECTROMAGNETIC DOOR LOCK

Technical Field

The present invention relates to a door lock for commercial or household electrical equipment, and particularly to an electromagnetic door lock having a function of providing compensation for a gasket.

Background

Normal use of electrical equipment has certain requirements to a door lock mechanism of the equipment. In commercial or household electrical equipment such as a washing machine, a dishwasher, etc., the door needs to be completely sealed off before normal start of operation. Generally, a gasket is additionally installed on the door to enhance the sealing performance. However, gaskets are generally made of rubber or plastic, and the sealing performance of the gaskets may be rendered different due to different production processes in different factories, different elastic properties of materials, different degrees of thermal expansion, different levels of aging and different factors affecting the change of a door hook such as the length of the door hook, thereby affecting the sealing performance of the door locks.

Summary of the invention

In order to overcome the deficiencies in the prior art, the present invention provides an electromagnetic door lock having a function of making compensation to a gasket, the electromagnetic door lock comprising: a door lock case which has a base portion, a mounting bracket being provided on the door lock case, the mounting bracket being movable up and down or to and fro relative to the base portion of the door lock case, the mounting bracket being oppositely provided with two ends in a lengthwise direction thereof, and mounting slots being provided oppositely on the two ends; a cam from whose both sides camshafts extend out, the camshafts being respectively mounted in the mounting slots at the two ends of the mounting bracket so that the cam is rotatable about an axis in the lengthwise direction of the mounting bracket via the camshafts, a door lock hook being provided in the middle of the cam to receive a door hook, and an upper portion of

the cam being provided with a step which has an upper contact surface and a lower contact surface; and a cam pillar mounted on the door lock case at an upper side or one lateral side of the cam.

5 The electromagnetic door lock of the present invention has a cam which can lock the door hook to lock the door lock when the cam rotates, meanwhile, the cam can also move upwardly to tighten the door hook; therefore, it is possible to overcome the problem of insufficient sealing caused by differences in the thickness of gaskets or the elastic property thereof, the inconsistency in length of the door
10 hooks, and other factors affecting the variation of the door lock.

Description of the Drawings

Figure 1A is a front perspective structural schematic view of a door lock 100 of the present invention;

15 figure 1B is a rear perspective structural schematic view of the door lock 100 of the present invention;

figure 2A is a structural schematic view showing the internal of the door lock 100 of figure 1A after a lock case cover 125 is opened;

20 figure 2B is a structural schematic view showing that a locking pin 230 of an electromagnet assembly 120 in figure 2A is not pushed down to lock a locking slider 240;

figure 2C is a structural schematic view showing that the locking pin 230 of the electromagnet assembly 120 in figure 2A is pushed down to lock the locking slider 240;

25 figure 3 is a structural exploded view of various components of figure 2A;

figure 4A is a front structural schematic view of a cam 108;

figure 4B is a side structural schematic view of the cam 108;

figure 5A is a front structural schematic view of a mounting bracket 106;

figure 5B is a rear structural schematic view of the mounting bracket 106;

30 figure 6A is a structural schematic view showing that the mounting bracket 106 is bounced up;

figure 6B is a structural schematic view showing that the mounting bracket 106 is depressed;

figure 7A is a structural schematic view showing that a door hook 710 is to be inserted into a door lock hole 104;

5 figure 7B is a structural schematic view showing that the door hook 710 is hooked to a door lock hook 420 and then pushes the cam 108 to rotate;

figure 7C is a structural schematic view showing that the door hook 710 is hooked to the door lock hook 420 and then the cam 108 is moved upwardly;

10 figure 7D is a structural schematic view showing that the door hook 710 is hooked to the door lock hook 420 and then pulls the cam 108 down; and

figure 7E is a structural schematic view showing that the door hook 710 is to be disengaged from the door lock hook 420.

Detailed description of Embodiments of the Invention

15 Various embodiments of the present invention will be described below with reference to the accompanying drawings which constitute a part of the description. It should be understood that although in the present invention direction-indicating terms such as "front", "rear", "upper", "lower", "left", "right", "perpendicular", or "parallel" and so on are used to describe various exemplary structural parts and
20 elements of the invention, these terms herein are used only for convenient illustration and are determined based on the exemplary orientations shown in the drawings. Since the embodiments disclosed in the present invention may be arranged in different directions, these direction-indicating terms are merely illustrative and should not be regarded as limiting. In the following drawings,
25 identical parts are provided with identical reference numbers, and similar parts are provided with similar reference numbers, in order to avoid repeated description.

For the convenience of identification, the reference signs in the figures are listed as follows:

30 door lock 100
door lock case 101

door lock hole 104
cam 108
base portion 109
cam pillar 110
5 two ends 112, 114
electromagnetic assembly 120
lock case cover 125
cartridge lock 210
cartridge lock frame 212
10 iron core 214
cartridge lock spring 216
electromagnetic coil 220
elastic sheet 218
locking pin 230
15 locking slider 240
rotation curved surface (of the locking slider) 334
guide pillar 255
transverse chute 256
chute wall 258
20 slider locking hole 260
mounting slots (301, 302)
camshafts (312, 314)
step 321
upper contact surface 322
25 lower contact surface 324
cam lower portion 330
rotation curved surface (of the cam) 332
supporting springs (340, 342)
slider springs (360, 362)
30 supporting columns (380, 382)
spring pillars (384, 386)

holes (388, 389).
door lock hook 420
chutes (503, 504)
slots (508, 509)
5 door hook 710

Figure 1A is a front perspective structural schematic view of a door lock 100 of the present invention. The electromagnetic door lock 100 as shown in figure 1A comprises a door lock case 101, which door lock case 101 has a base portion 109; in
10 this figure, the left-hand part of the door lock case 101 is an electromagnetic assembly 120 which is covered by a lock case cover 125; the electromagnetic assembly 120 is used to open and close the door lock (see figures 2B and 2C for details); in this figure, a door lock hole 104 (see figure 1B for details) is provided at a position on the right and inner side of the door lock case 101, and a mounting
15 bracket 106 is provided above the door lock case 101 corresponding to the position; a cam 108 is provided inside the mounting bracket 106 and a cam pillar 110 is provided above the cam 108. The mounting bracket 106 is movable up and down or to and fro relative to the base portion 109 of the door lock case 101, and drives the
20 cam 108 inside thereof to move up and down or to and fro at the same time; the mounting bracket 106 is provided with two opposite ends (112, 114) in a lengthwise direction thereof, and mounting slots (301, 302) (see figure 5B) are provided oppositely on the two ends (112, 114).

Figure 1B is a rear perspective structural schematic view of the door lock 100
25 of the present invention. As shown in figure 1B, a back face of the base portion 109 of the door lock 100 is provided with the door lock hole 104, which door lock hole 104 directly faces a door hook 710 (see figures 7A-7E) on a door of an electrical equipment; when the door is closed, the door hook 710 is inserted into the door lock hole 104 and engages with a door lock hook 420 (see figures 4A and 4B) on the cam.
30 108 inside the door lock 100.

Figure 2A is a structural schematic view showing the internal of the door lock of figure 1A after the lock case cover 125 is opened. As shown in figure 2A, after the lock case cover 125 is opened, it can be seen that the electromagnetic assembly 120 comprises an electromagnetic coil 220, a cartridge lock 210, a cartridge lock frame 212 (provided with an iron core 214 and a cartridge lock spring 216 therein), an elastic sheet 218, and a lock pin 230, etc., wherein the electromagnetic coil 220 controls the connection and disconnection of a circuit via a switch and generates a magnetic force to attract the iron core 214 inside the cartridge lock 210 to move back and forth (or to and fro) in the cartridge lock 210, while driving the cartridge lock frame 212 to move back and forth (or to and fro) and the elastic sheet 218 to move up and down, thereby moving the locking pin 230 up and down, so as to lock or unlock a locking slider 240 (see figures 2B and 2C).

Figure 2B is a structural schematic view showing that the locking pin 230 of the electromagnet assembly 120 in figure 2A is not pushed down to lock a locking slider 240 (the door lock case 101, the lock case cover 125 and other parts of the bracket are hidden from view); the electromagnetic assembly 120 further comprises a guide pillar 255 on the cartridge lock frame 212, the locking slider 240 comprises a transverse chute 256, and the electromagnetic door lock 100 of the present invention is shown in this figure in an initial/released position (the door is not closed). As shown in figure 2B, the slider 240 is in a free position, and the guide pillar 255 on the cartridge lock frame 212 is limited by a chute wall 258 of the transverse chute 256 such that even if a switch button of the door lock is pressed down to apply a driving signal to the electromagnetic coil 220, the cartridge lock frame 212 cannot move in the direction indicated by arrow A (i.e. the direction of the axis thereof).

Figure 2C is a structural schematic view showing that the locking pin 230 of the electromagnet assembly 120 in figure 2A is pushed down to lock the locking slider 240 (the door lock case 101, the lock case cover 125 and other parts of the bracket are hidden from view), the electromagnetic door lock 100 of the present

invention being shown in a locked position. As shown in figure 2C, when the door is closed, the locking slider 240 is pushed to the locked position, and a slider locking hole 260 on the locking slider 240 is aligned with the locking pin 230; meanwhile, the guide pillar 255 on the cartridge lock frame 212 is aligned with a longitudinal slot in the chute 256. In this case, once the electromagnetic coil 220 receives the driving signal (such as a pulse signal), the cartridge lock frame 212 can be dragged to move in the direction indicated by arrow A (i.e. the direction of the axis thereof). After the cartridge lock frame 212 has moved away, since the limitation to the lock pin 230 by the cartridge lock frame 212 and the locking slider 240 has been released, the lock pin 230 moves downward (as indicated by arrow C) under the action of an elastic force of the elastic sheet 218 and is inserted into the slider locking hole 260 of the locking slider 240. As shown in figure 2C, when the guide pillar 255 is aligned with the longitudinal slot in the chute 256, the cartridge lock frame 212 can move back and forth in the direction indicated by arrow A, the locking slider 240 can move back and forth in the direction indicated by arrow B, the locking pin 230 moves back and forth in the direction indicated by arrow C, and any two of the three movement directions are orthogonal to each other or different from each other. In fact, for more particular description of the electromagnetic assembly 120 shown in figures 2B and 2C, reference can be made to the published description of a Chinese patent with application no. 201210072421.6, which is incorporated into the present application by reference in its entirety, and is one of the specific embodiments of the present invention.

Figure 3 is a structural exploded view of various components of figure 2A (the electromagnetic assembly 120 is partially hidden from view in this figure). As shown in figure 3, the electromagnetic door lock 100 includes the door lock case 101, the mounting bracket 106, the cam 108, the cam pillar 110, the locking slider 240, the locking pin 230, and supporting springs (340, 342) etc.; the door lock case 101 has the base portion 109, the mounting bracket 106 is mounted on the base portion 109 of the door lock case 101 on the right-hand side thereof, the mounting bracket 106 is provided oppositely with two ends (112, 114) in the lengthwise

direction thereof (B-B axis), and the mounting slots (301, 302) are provided oppositely on the two ends (112, 114); the mounting bracket 106 is movably mounted on the base portion 109 of the door lock case 101, and can move up and down or to and fro relative to the base portion 109 of the door lock case 101.

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The base portion 109 is provided with two supporting columns (380, 382) that protrude upward, two chutes (503, 504) (see figure 5B) are provided inside the two ends (112, 114) of the mounting bracket 106 towards the base portion 109, and the supporting columns (380, 382) are respectively inserted into the chutes (503, 504) to define rectilinear movement of the mounting bracket 106. Two spring pillars (384, 386) protruding upward are provided on the base portion 109 outside the two supporting columns (380, 382), and two slots (508, 509) adapted for the spring pillars (384, 386) are provided inside the two ends (112, 114) of the mounting bracket 106 towards the base portion (109). Two supporting springs (340, 342) are sleeved around the spring pillars (384, 386) and fitted between the base portion 109 and the mounting bracket 106.

Camshafts (312, 314) extend out from both sides of the cam 108, the camshafts (312, 314) are respectively mounted in the mounting slots (301, 302) at the two ends of the mounting bracket 106 so that the cam 108 is rotatable about the axis B-B in the lengthwise direction of the mounting bracket 106 via the camshafts (312, 314), the door lock hook 420 (see figures 4A and 4B) is provided in the middle of the cam 108 to receive the door hook 710 (see figures 7A-7E), and an upper portion of the cam 108 is provided with a step 321, which step 321 has an upper contact surface 322 and a lower contact surface 324.

The cam pillar 110 is mounted on the door lock case 101 at an upper side or one lateral side of the cam 108. In particular, holes (388, 389) are provided at ends of the supporting columns (380, 382), and both ends of the cam pillar 110 are inserted into the holes (388, 389) across the mounting bracket 106 and the cam pillar 110 abuts against the upper contact surface 322 of the cam 108 (in the initial

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position). The upper contact surface 322 of the cam 108 is an arcuate end face, and the cam pillar 110 catches the arcuate end face so that the cam 108 is retained in the initial position when the cam 108 does not move. The upper contact surface 322 is configured as an arcuate end face in order for the cam 108 to smoothly slide over a lower end of the cam pillar 110 when the cam rotates. As the cam 108 rotates about the axis B-B in the lengthwise direction of the mounting bracket 106, the cam pillar 110 makes contact with the upper contact surface 322 (in the initial position) or the lower contact surface 324 (in the final position) of the step 321.

The locking slider 240 is disposed in parallel with the base portion 109 of the door lock case 101, and moves to and fro along with rotation of the cam 108; the cam 108 is unmovable when the locking slider 240 moves to the locked position and is locked unmovable. The right-hand side of the locking slider 240 abuts against the cam 108, a rotation curved surface 332 is provided at an edge on one side (i.e. the side adjacent to the locking slider 240) of a lower portion 330 of the cam 108, a rotation curved surface 334 is provided at an edge on one side (i.e. the right-hand side) of the locking slider 240 adjacent to the cam 108, and the rotation curved surface 334 of the locking slider 240 cooperates with the rotation curved surface 332 of the lower portion 330 of the cam 108; when the door hook 710 is inserted, the cam 108 is pushed by the door hook 710 to rotate counter-clockwise and then move upwardly, the rotation curved surface 332 of the lower portion 330 of the cam 108 moves away from the rotation curved surface 334 of the locking slider 240, and the locking slider 240 is pushed by the slider spring (360, 362) to move towards the cam 108; and when the door hook 710 is drawn out, the cam 108, pulled by the door hook 710, moves downward and then rotates clockwise, and the rotation curved surface 332 of the lower portion 330 of the cam 108 pushes the locking slider 240 back to the initial position.

One side of the locking slider 240 is provided with the locking hole 260, and the locking pin 230 is inserted into the locking hole 260 to lock the locking slider 240 when the locking slider 240 moves to the locked position. As the door of the

machine equipment is closed, the door lock 710 is inserted into the door lock hole 104 and the locking slider 240 moves to the locked position, and after the machine equipment is powered on, the locking pin 230 is driven by the electromagnetic assembly 120 to move to a closed position and lock the locking slider 240. The slider springs (360, 362) always apply a rightward pushing force to the locking slider 240.

Figure 4A is a front structural schematic view of the cam 108; as shown in figure 4A, the camshafts (312, 314) extend out from both sides of the cam 108 such that the cam 108 is rotatable about the axis B-B (see figure 3) in the lengthwise direction of the mounting bracket 106 via the camshafts (312, 314), the door lock hook 420 is provided in the middle of the cam 108 to receive the door hook 710 (see figures 7A-7E), and the upper portion of the cam 108 is provided with the step 321, which step 321 has the upper contact surface 322 and the lower contact surface 324.

Figure 4B is a side structural schematic view of the cam 108. As shown in figure 4B, the upper contact surface 322 is an arcuate end face, and when the cam 108 is in the initial position, the upper contact surface 322 abuts against the cam pillar 110; since the upper contact surface 322 is an arcuate end face, the cam 108 can slide relative to the cam pillar 110 more smoothly when the cam rotates. The rotation curved surface 332 is provided at an edge on one side of the lower portion 330 of the cam 108, and the rotation curved surface 332 cooperates with the rotation curved surface 334 of the adjacent locking slider 240.

Figure 5A is a front structural schematic view of the mounting bracket 106. As shown in figure 5A, the mounting bracket 106 does not have a slot base and is of a hollow design; the mounting bracket 106 is provided with the two opposite ends (112, 114) in a lengthwise direction thereof, and the mounting slots (301, 302) are provided oppositely on the two ends (112, 114). The camshafts (312, 314) extending out from both sides of the cam 108 are respectively mounted in the mounting slots (301, 302) such that the cam 108 is rotatable about the axis B-B (see figure 3) in the

lengthwise direction of the mounting bracket 106 via the camshafts (312, 314). The mounting bracket 106 is further provided with chutes (503, 504), the base portion 109 is provided with the two supporting columns (380, 382) that protrude upward, and the supporting columns (380, 382) are respectively inserted into the chutes (503, 504) to support the mounting bracket 106 and define rectilinear movement of the mounting bracket 106.

Figure 5B is a rear structural schematic view of the mounting bracket 106; as shown in figure 5B, the mounting bracket 106 comprises the two ends (112, 114), a hole 510 in which the cam 108 is arranged, the chutes (503, 504), and the slots (508, 509) etc. The chutes (503, 504) are hollowed from top to bottom, and each of the slots (508, 509) have a slot bottom; the slots (508, 509) are used for the insertion of the two spring pillars (384, 386) provided on the base portion 109 and the two supporting springs (340, 342) sleeved around the spring pillars (384, 386). The supporting springs (340, 342) are used to apply an upward pushing force to the mounting bracket 106 so as to tighten the cam 108.

Figure 6A is a structural schematic view showing that the mounting bracket 106 is bounced up. As shown in figure 6A, the mounting bracket 106 is mounted on the base portion 109 of the door lock case 101, the base portion 109 is provided, successively from left to right, with the spring pillar 384, supporting column 380, supporting column 382 and spring pillar 386; the mounting bracket 106 is provided, successively from left to right, with the slot 508, chute 503, chute 504 and slot 509, and the spring pillar 384, the supporting column 380, the supporting column 382 and the spring pillar 386 are respectively inserted into the slot 508, the chute 503, the chute 504 and the slot 509, wherein the supporting springs 340 and 342 are sleeved around the spring pillars 384 and 386. The figure shows a structural schematic view showing that the mounting bracket 106 is bounced up by the supporting springs 340 and 342 when the cam 108 (not shown) is pushed away by the door hook 710 (not shown) and the upper contact surface 322 of the cam 108 slides away from the cam pillar 110, wherein the mounting bracket 106 moves

upwardly along with the cam 108.

Figure 6B is a structural schematic view showing that the mounting bracket 106 is depressed; as shown in figure 6B, when the door hook 710 is drawn out, the cam 108 is driven to rotate and at the same time move downward; and when the upper contact surface 322 is engaged with the cam pillar 110, the cam 108 drives the mounting bracket 106 to move downward, and the supporting springs 340 and 342 are compressed. It can be seen from figure 6B that the chutes 503 and 504 are through-chutes, and the supporting columns 380 and 382 may pass through the mounting bracket 106.

Figure 7A is a structural schematic view showing that the door hook 710 is to be inserted into the door lock hole 104; shown in figure 7A are the door lock case 101 (and the base portion 109), the locking slider 240, the locking pin 230, the cam 108, the door hook 710, the cam pillar 110, and the mounting bracket 106 etc. The locking slider 240 is arranged in parallel with the base portion 109, and the locking slider is movable to and fro relative to the cam 108; the locking slider 240 is provided with the locking hole 260, and the locking pin 230 can be aligned with the locking hole 260 and inserted therein downwardly. The locking slider 240 moves into/away from the initial position, with the right-hand side thereof abutting against the cam 108, and the radius of the rotation curved surface 334 on the right-hand side of the locking slider 240 cooperates with that of the rotation curved surface 332 on one side of the lower portion 330 of the cam 108. As shown in this figure, the door hook 710 moves in the direction A to be inserted into the door lock hole 104, and has not yet been hooked to the door lock hook 420 of the cam 108. The upper contact surface 322 of the cam 108 remains engaged with the cam pillar 110.

Figure 7B is a structural schematic view showing that the door hook 710 is hooked to the door lock hook 420 and then pushes the cam 108 to rotate; the door hook 710 moves upwardly in the direction A until it is hooked to the door lock hook 420, and then pushes the cam 108 to rotate in the direction B (the counter-clockwise

direction), and the upper contact surface 322 of the cam 108 is disengaged from the cam pillar 110; the rotation curved surface 332 of the lower portion 330 of the cam 108 moves away from the rotation curved surface 334 of the locking slider 240, and the locking slider 240 slides rightward in the direction D under the action of the pushing forces provided by two slider springs (360, 362) (not shown in the figure) which are provided on the left-hand side of the locking slider 240 away from the cam 108; and when the locking hole 260 of the slider moves to a position corresponding to the locking pin 230, the electromagnetic assembly 120 pushes the locking pin 230 to move downwardly in the direction E to be inserted into the locking hole 260.

Figure 7C is a structural schematic view showing that the door hook 710 is hooked to the door lock hook 420 and then the cam 108 is moved upwardly. As shown in this figure, the door hook 710 continues to move upwardly in the direction A; meanwhile, the supporting springs 340 and 342 push the mounting frame 106 and the cam 108 together to move upwardly in the direction C, and the cam 108 is moved upwardly in the direction C to a locked position. A final position, also referred to as an ultimate "locked position", is a position where the lower contact surface 324 of the step 321 on the cam 108 makes contact with the cam pillar 110; the upper portion of the rotation curved surface of the locking slider 240 takes on a straight line segment, and all the positions going downward from the final position along the straight line segment can serve as locked positions, forming a compensation area; within this compensation area, the door hook 710 can always be stopped and locked while the cam 108 can move upwardly to tighten the door hook 710, so as to compensate for the sealing problem caused by inconsistencies in the gasket thickness and in the door hook length. When reaching a locked position, the locking pin 230 also moves downwardly in the direction E to be inserted into the locking hole 260, and at this moment the locking slider 240 is locked unmovable, and the cam 108 is also engaged in the locked position by the locking slider 240 and the cam pillar 110 and cannot move. The door hook 710 is hooked to the door lock hook 420 and cannot be drawn out, and the door lock is locked.

Figure 7D is a structural schematic view showing that the door hook 710 is hooked to the door lock hook 420 and then pulls the cam 108 down; when it is required to open the door lock, the switch is pressed, and the electromagnetic assembly 120 will pull up the locking pin 230 in the upward direction E', and then the locking slider 240 can move freely; the door hook 710 moves downwardly in the direction A', and also drives the cam 108 to rotate in the direction B' (a clockwise direction) and at the same time move downwardly in the direction C', thereby driving the mounting bracket 106 also to move downwardly in the direction C'. When the cam 108 rotates, the rotation curved surface 332 of the lower portion 330 of the cam 108 applies a leftward pushing force to the rotation curved surface 334 of the locking slider 240, so as to push the locking slider 240 to the left in the direction D' and back to the initial position.

Figure 7E is a structural schematic view showing that the door hook 710 is to be disengaged from the door lock hook 420; as shown in figure 7E, the door hook 710 is disengaged from the door lock hook 420, and the door of the electrical appliance will be opened. The cam 108 returns to the initial position, and the upper contact surface 322 is engaged with the cam pillar 110. The locking slider 240 returns to the initial position, with the right-hand side thereof abutting against the cam 108, and the radian of the rotation curved surface 334 on the right-hand side of the locking slider 240 cooperates with that of the rotation curved surface 332 on one side of lower portion 330 of the cam 108.

Although the present invention has been described with reference to the specific embodiments shown in the drawings, it is to be understood that the door lock base and door lock of the present invention may have many variations without departing from the spirit, scope and background taught by the present invention. It would be also appreciated by those skilled in the art that there are different ways to change the parameters in the disclosed embodiments of the present invention, such as sizes, shapes, or types of elements or materials, which all fall within the spirit

and scope of the invention and claims.

5 It should also be noted that in the present invention, the door lock mechanism of the present invention has been described in connection with a washing machine; however, those skilled in the art could expediently apply the door lock mechanism of the present invention to any other electrical equipment having the same (or similar) requirements.

Claims

1. An electromagnetic door lock (100), comprising a door lock case (101) which has a base portion (109), characterized in that the electromagnetic door lock (100) comprises:

5 a mounting bracket (106) being provided on the door lock case (101), the mounting bracket (106) being movable up and down (or to and fro) relative to the base portion (109) of the door lock case (101), the mounting bracket (106) being oppositely provided with two ends (112, 114) in a lengthwise direction thereof, and mounting slots (301, 302) being provided oppositely on the two ends (112, 114),

10 a cam (108) from whose both sides camshafts (312, 314) extend out, the camshafts (312, 314) being respectively mounted in the mounting slots (301, 302) on the two ends of the mounting bracket (106) so that the cam (108) is rotatable about an axis (B-B) in the lengthwise direction of the mounting bracket (106) via the camshafts (312, 314), a door lock hook (420) being provided in the middle of the cam (108) to receive a door hook (710), an upper portion of the cam (108) being provided with a step (321) which has an
15 upper contact surface (322) and a lower contact surface (324);

a cam pillar (110) being mounted on the door lock case (101) at an upper side (or one lateral side) of the cam (108).

20 2. The electromagnetic door lock (100) according to claim 1, characterized in that:
as the cam (108) rotates about the axis (B-B) in the lengthwise direction of the mounting bracket (106), the cam pillar (110) contacts with the upper contact surface (322) or the lower contact surface (324) of the step (321).

25 3. The electromagnetic door lock (100) according to claim 1, characterized in that the electromagnetic door lock (100) further comprises:

a locking slider (240) being disposed in parallel with the base portion (109) of the door lock case (101), the locking slider (240) being pushed to abut the cam (108) by a slider spring (360, 362) disposed on one side thereof and being movable to and fro along with
30 rotation of the cam (108); the cam (108) being unmovable when the locking slider is locked unmovable.

4. The electromagnetic door lock (100) according to claim 2, characterized in that:

the upper contact surface (322) of the cam (108) is an arcuate end face, and the cam pillar (110) catches the arcuate end face (322) so that the cam (108) is retained at an initial position when the cam (108) does not move.

5 5. The electromagnetic door lock (100) according to claim 3, characterized in that the electromagnetic door lock (100) further comprises:

at least one slider spring (360, 362) which is disposed on one side of the locking slider (240) away from the cam (108), and which always applies a pushing force to the locking slider (240).

10 6. The electromagnetic door lock (100) according to claim 1, characterized in that:
a rotation curved surface (332) is provided at an edge on one side of a lower portion (330) of the cam (108), a rotation curved surface (334) is provided at an edge on one side of the locking slider (240) adjacent to the cam (108), the rotation curved surface (334) of
15 the locking slider (240) cooperates with the rotation curved surface (332) of the lower portion of the cam;

when the door hook (710) is inserted, the cam (108) is pushed by the door hook (710) to rotate counter-clockwise and then move upwardly, the rotation curved surface (332) of the lower portion (330) of the cam (108) moves away from the rotation curved surface (334) of the locking slider (240), and the locking slider (240) is pushed by the slider spring (360, 362) to move towards the cam (108);

20 when the door hook (710) is drawn out, the cam (108), pulled by the door hook (710), moves downward and then rotates clockwise, and the rotation curved surface (332) of the lower portion (330) of the cam (108) pushes the locking slider (240) back to the initial
25 position.

7. The electromagnetic door lock (100) according to claim 1, characterized in that:
the base portion (109) is provided with two supporting columns (380, 382) that protrude upward, two chutes (503, 504) are provided inside the two ends (112, 114) of the
30 mounting bracket (106) towards the base portion (109), the supporting columns (380, 382) are respectively inserted into the chutes (503, 504) to define rectilinear movement of the mounting bracket (106).

8. The electromagnetic door lock (100) according to claim 7, characterized in that:

two spring pillars (384, 386) protruding upward are provided on the base portion (109) outside the two supporting columns (380, 382), and two slots (508, 509) adapted for the spring pillars (384, 386) are provided inside the two ends (112, 114) of the mounting
5 bracket (106) towards the base portion (109);

two supporting springs (340, 342) are sleeved around the supporting pillars (384, 386) and fitted between the base portion (109) and the mounting bracket (106); when the door hook (710) is inserted in a door lock hole (104), the cam (108) is pushed to rotate counter-clockwise and after the cam rotates to move the upper contact surface (322) of the cam
10 (108) away from the cam pillar (110), the supporting springs (340, 342) push the mounting bracket (106) and the cam (108) to move upwardly and rectilinearly.

9. The electromagnetic door lock (100) according to claim 7, characterized in that:

holes (388, 389) are provided at ends of the supporting columns (380, 382), and both
15 ends of the cam pillar (110) are inserted into the holes (388, 389) across the mounting bracket (106).

10. The electromagnetic door lock (100) according to claim 3, characterized in that the electromagnetic door lock (100) further comprises:

20 a locking pin (230), the locking pin (230) is driven to move to a closed position and lock the locking slider (240) when the door hook (710) is inserted into the door lock hole (104) and the locking slider (240) moves to a locked position as a door of a machine equipment is closed.

11. The electromagnetic door lock (100) according to claim 10, characterized in that:

the locking slider (240) is provided with a locking hole (260), and the locking pin (230) is inserted into the locking hole (260) to lock the locking slider (240) when the locking
25 slider (240) moves to the locked position.

12. The electromagnetic door lock (100) according to claim 3, characterized in that the electromagnetic door lock (100) further comprises:

30

an electromagnetic assembly (120) being configured to push out and retract the locking pin (230) to lock and unlock the locking slider (240) after the machine equipment is energized.

- 5 13. An electrical appliance, characterized in that it uses the electromagnetic door lock (100) according to one of claims 1-12.

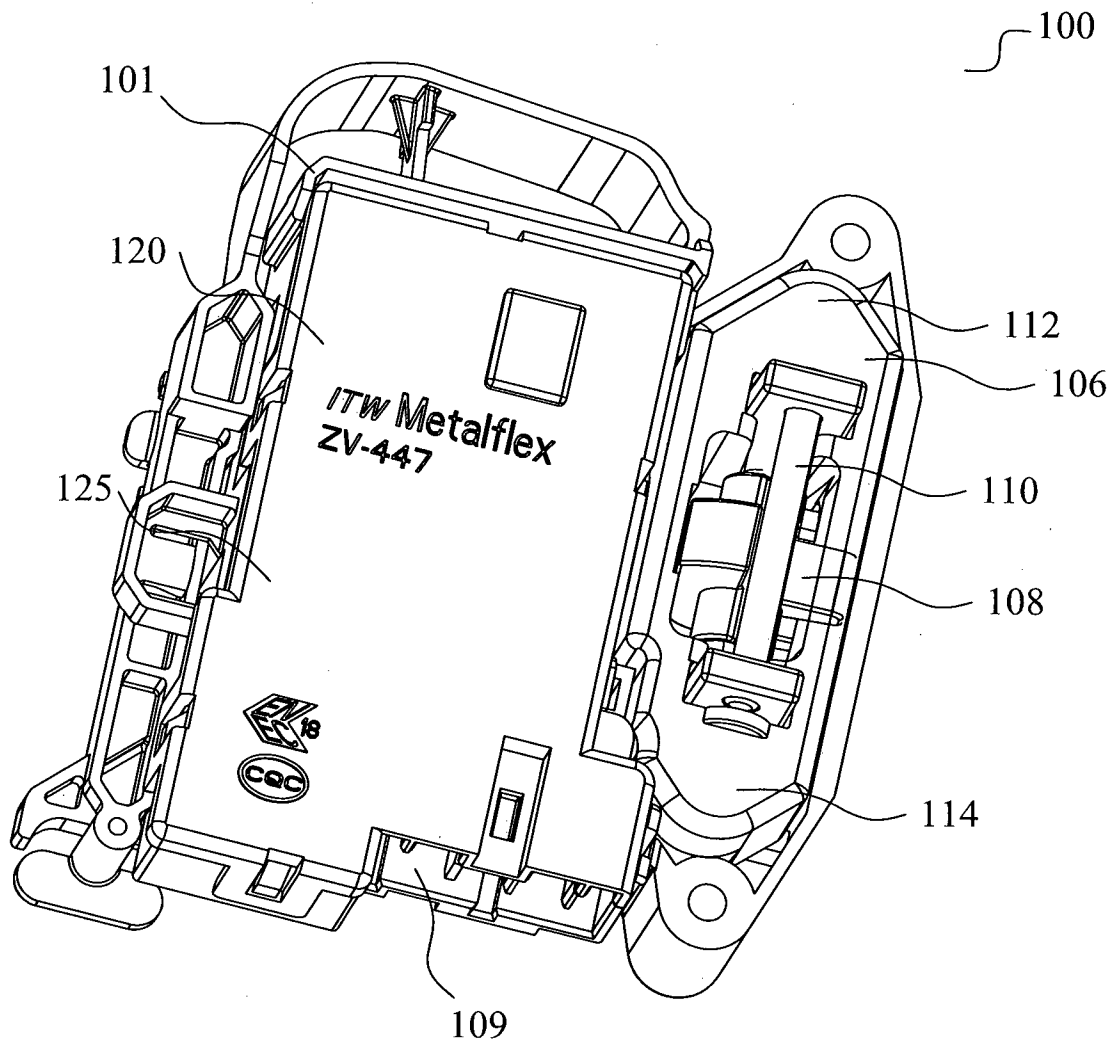


Fig. 1A

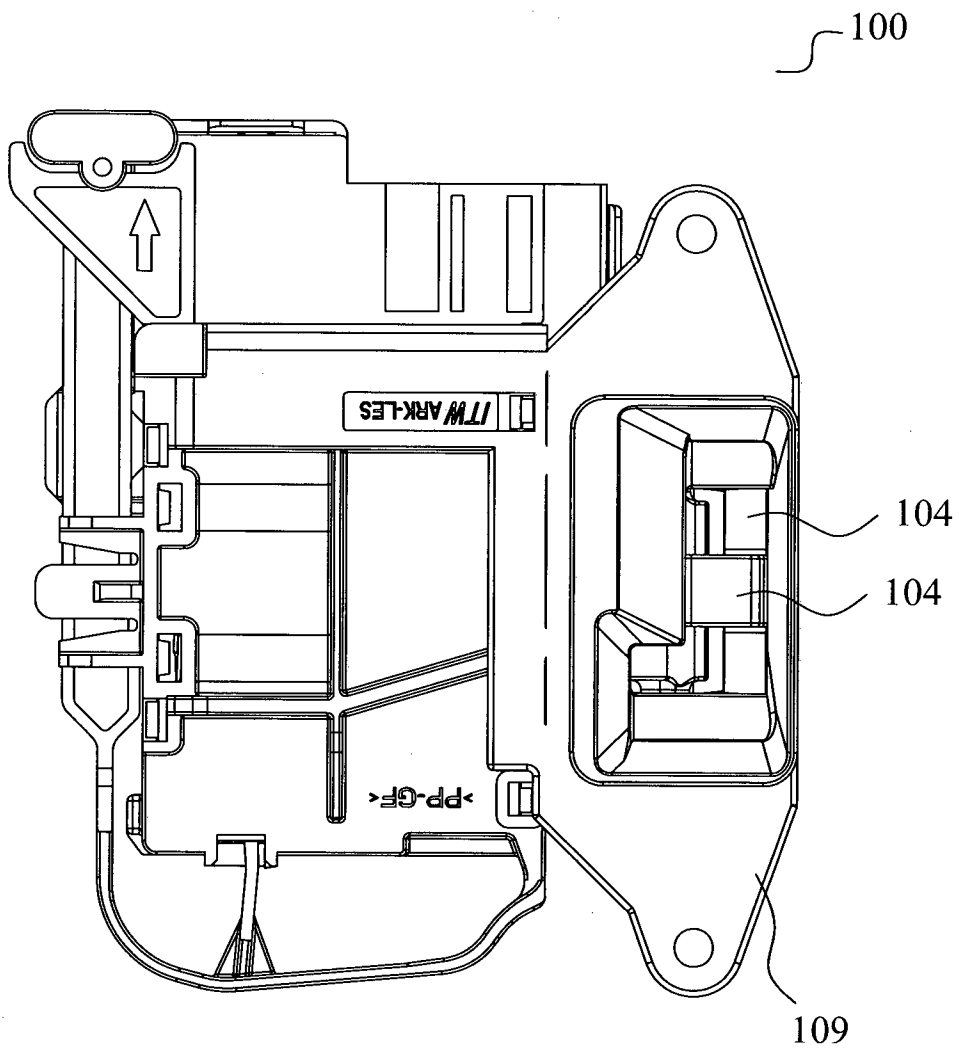


Fig. 1B

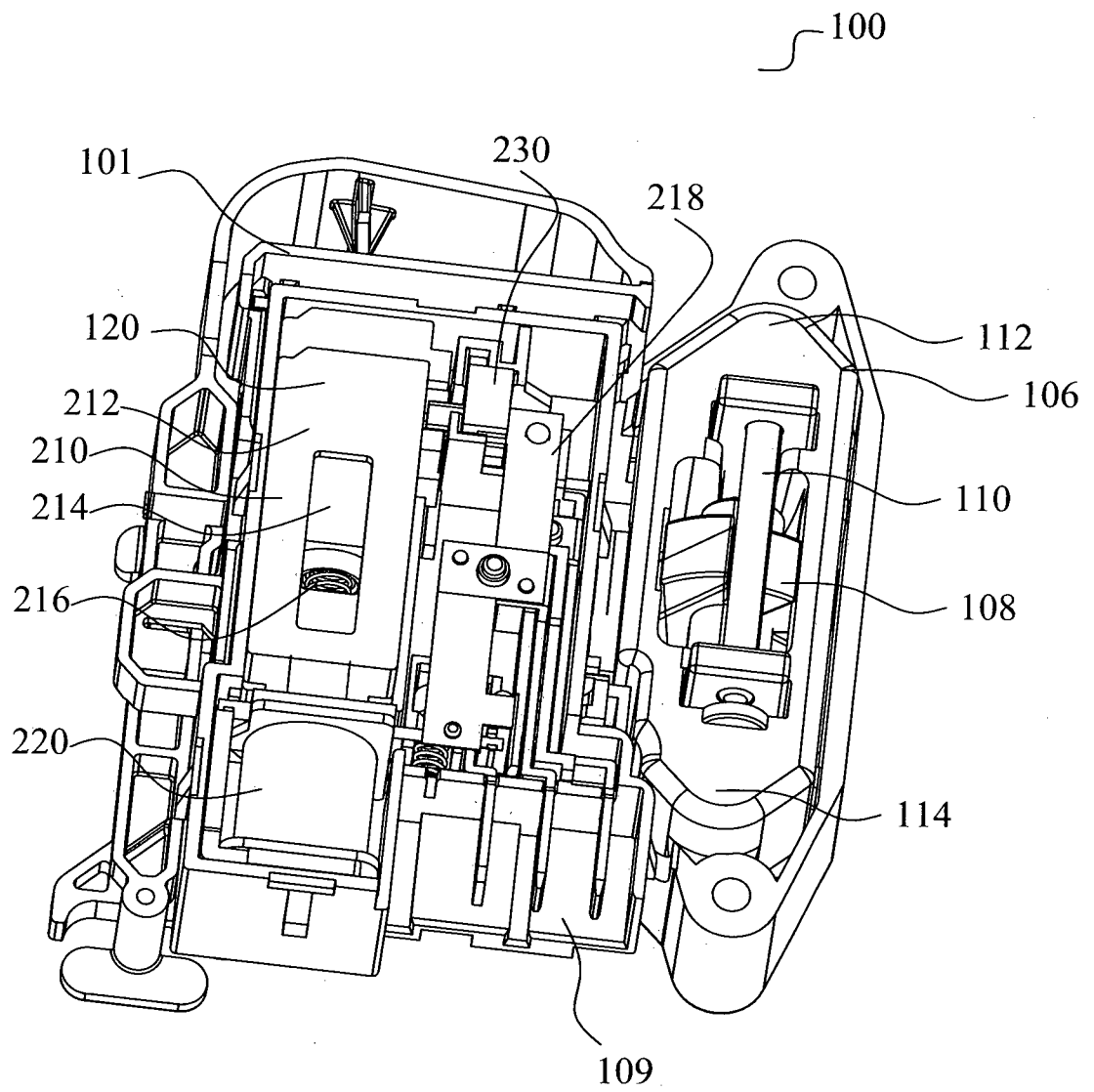


Fig. 2A

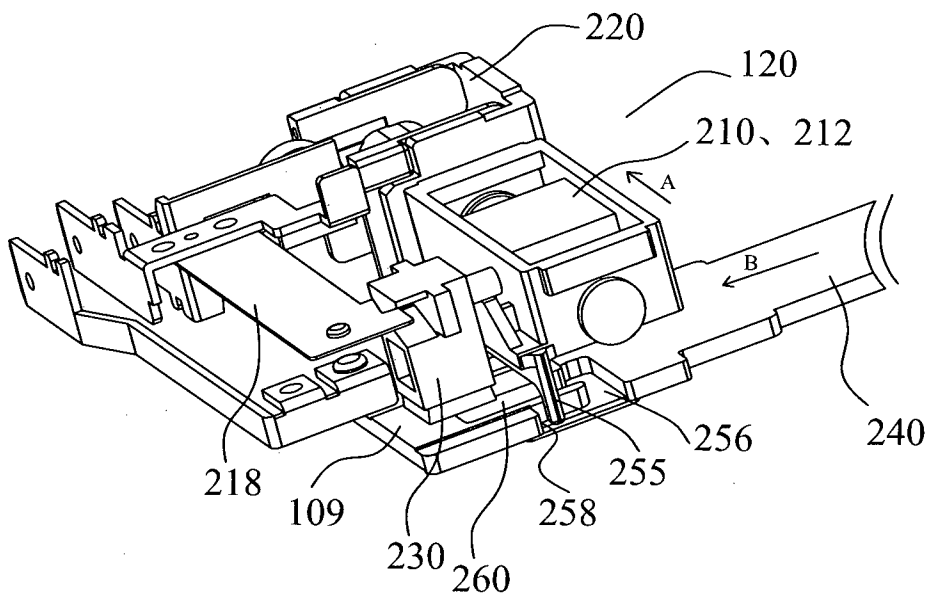


Fig. 2B

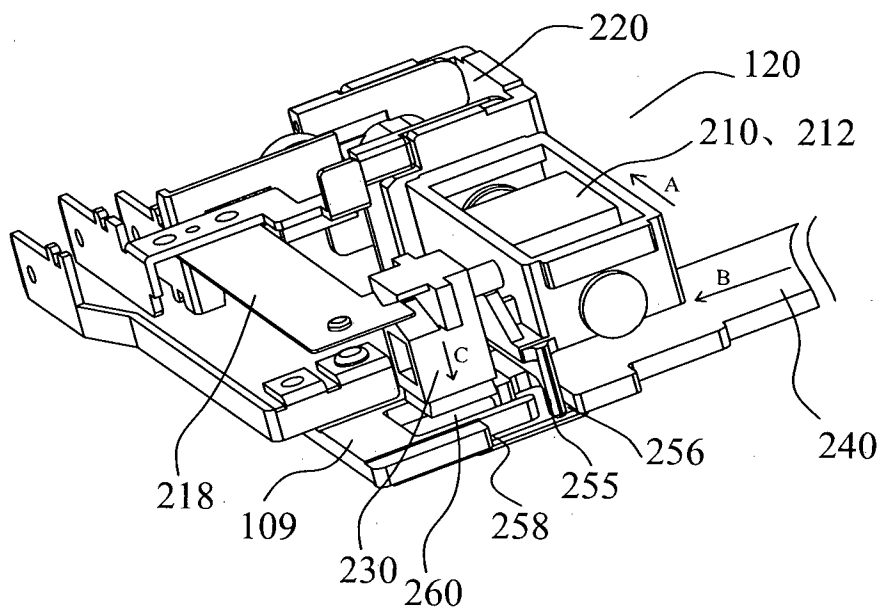


Fig. 2C

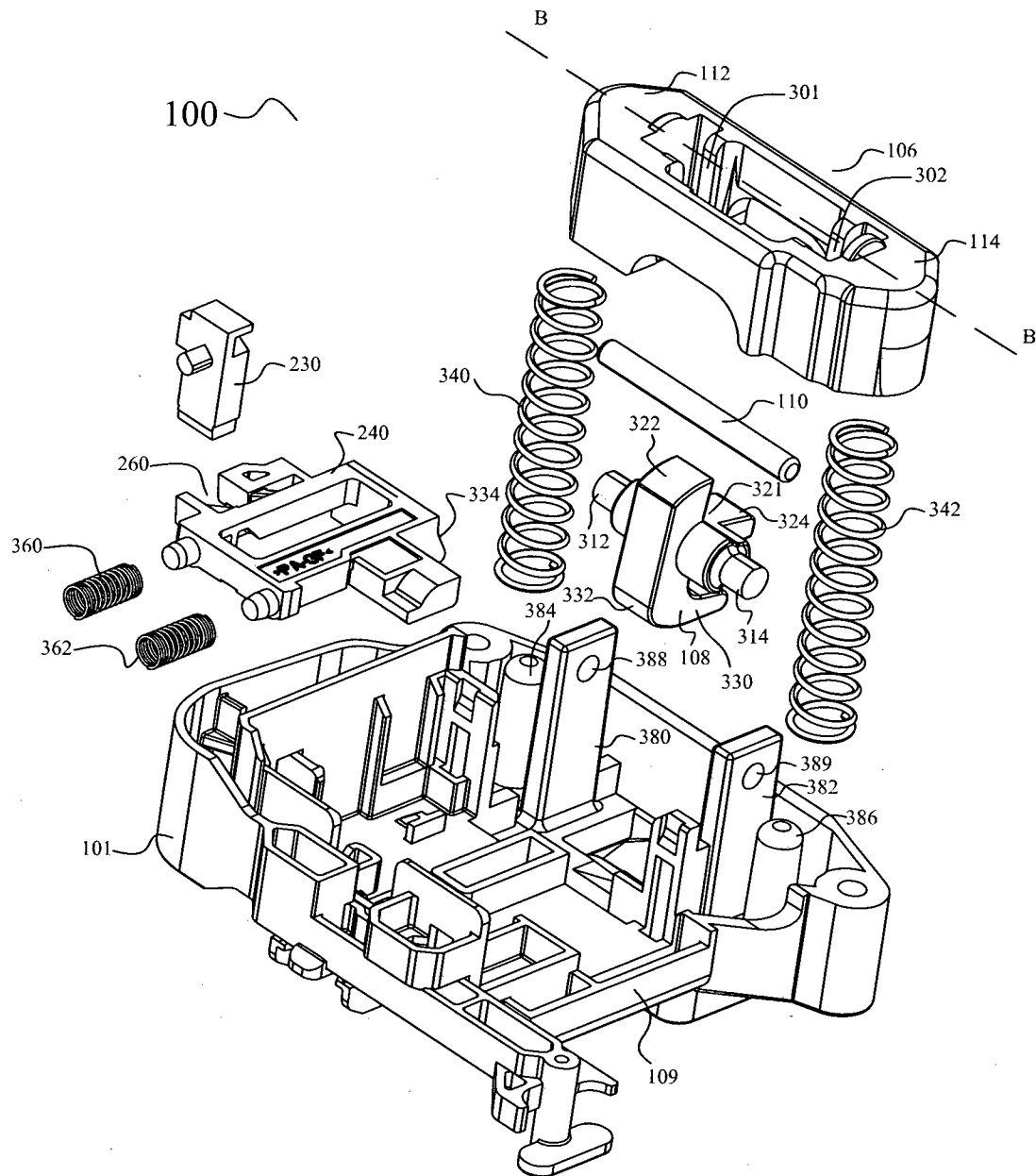


Fig. 3

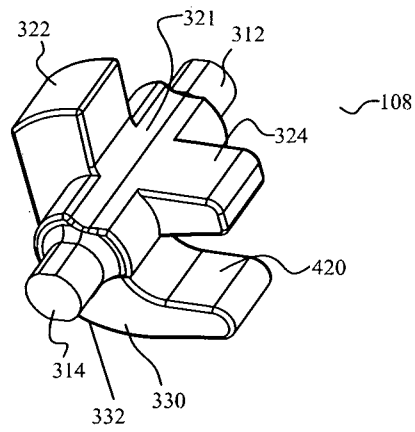


Fig. 4A

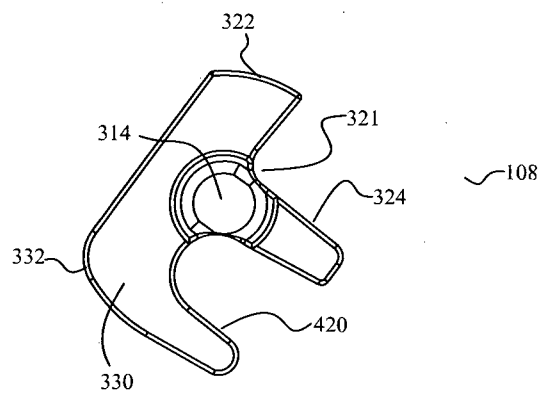


Fig. 4B

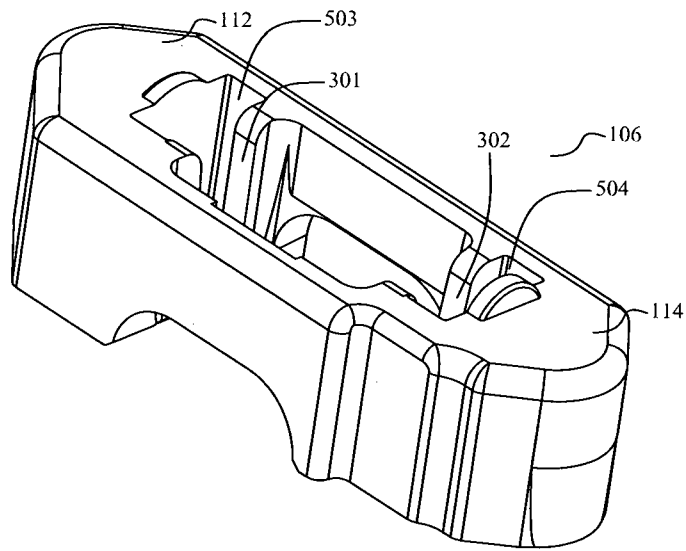


Fig. 5A

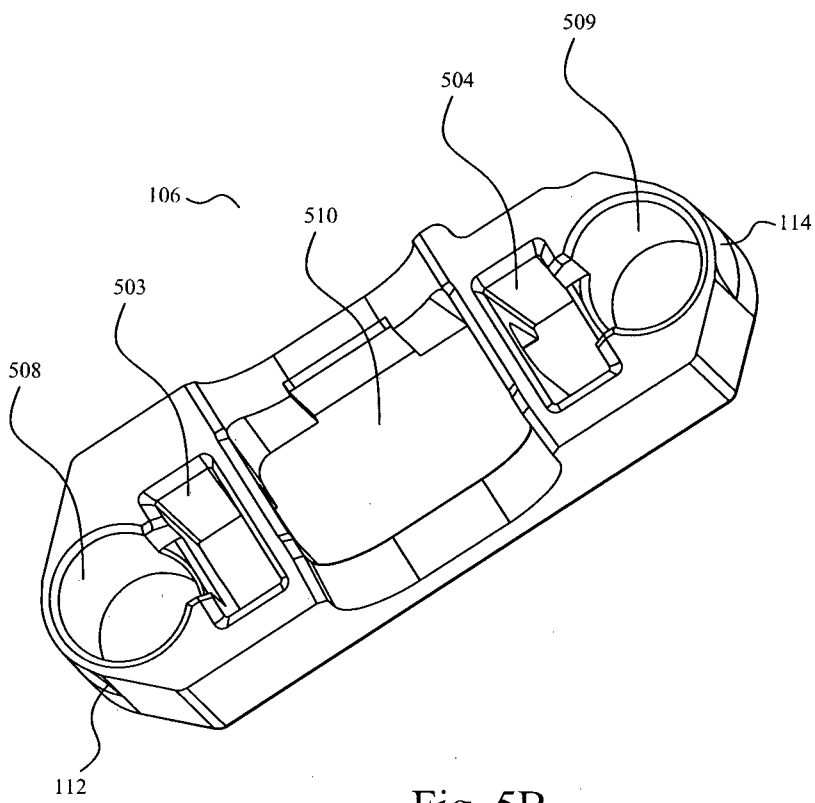


Fig. 5B

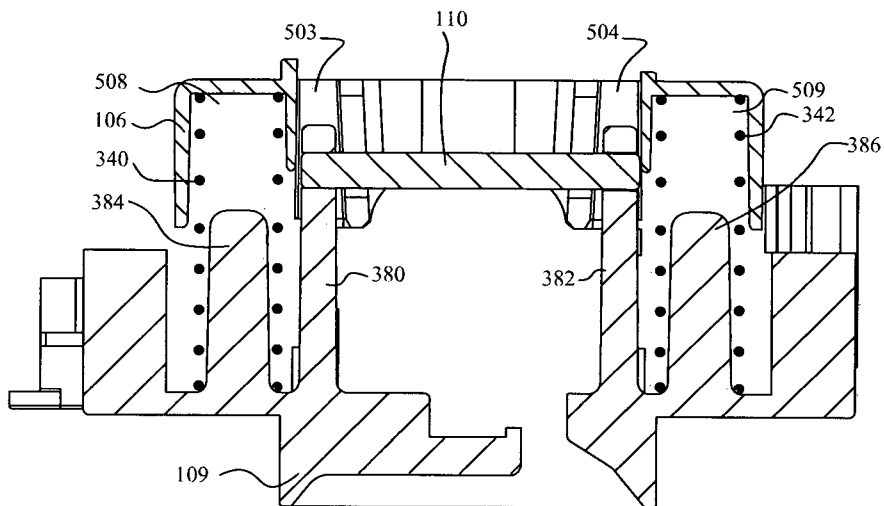


Fig. 6A

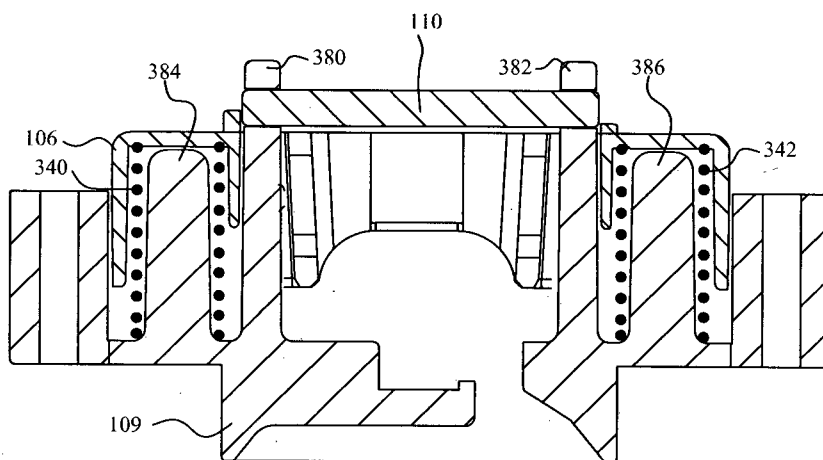


Fig. 6B

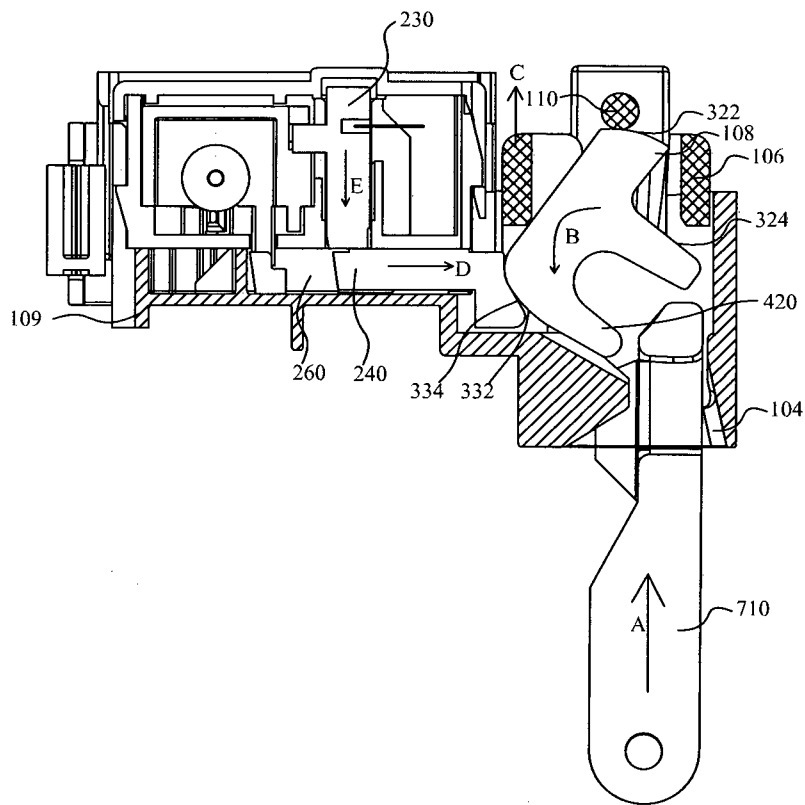


Fig. 7A

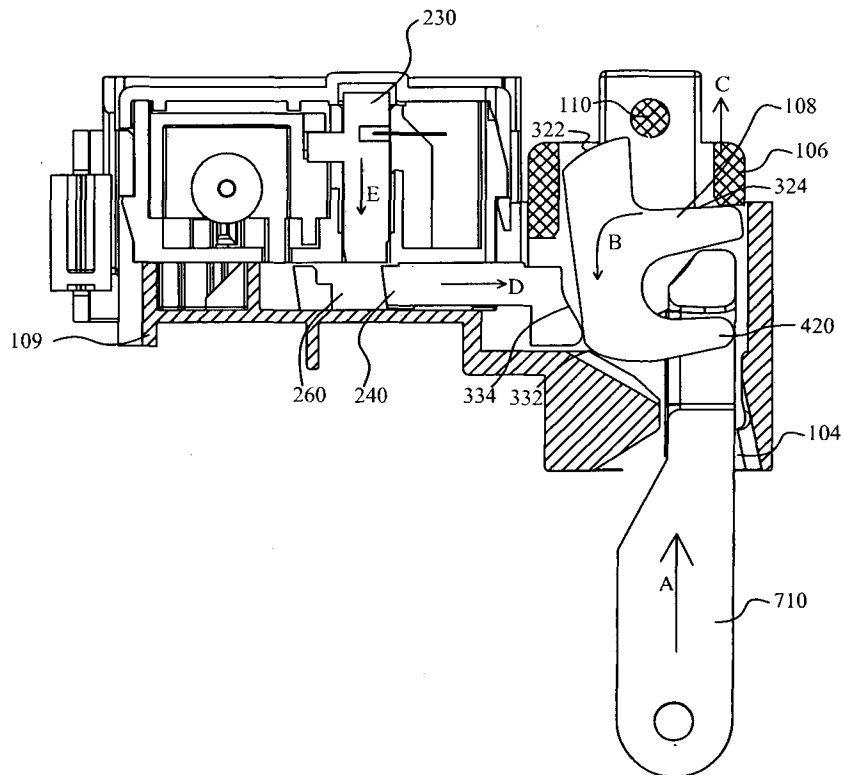


Fig. 7B

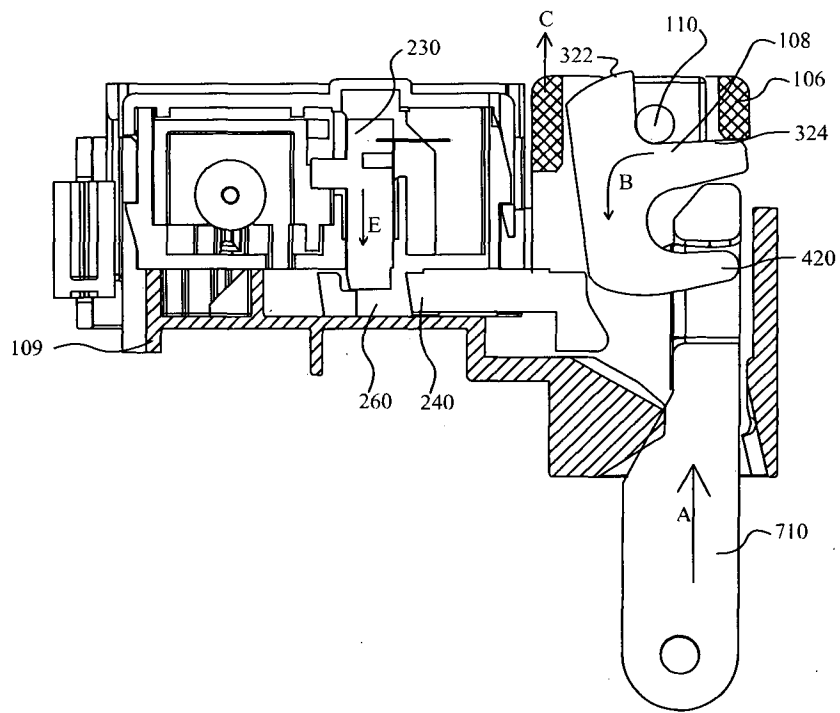


Fig. 7C

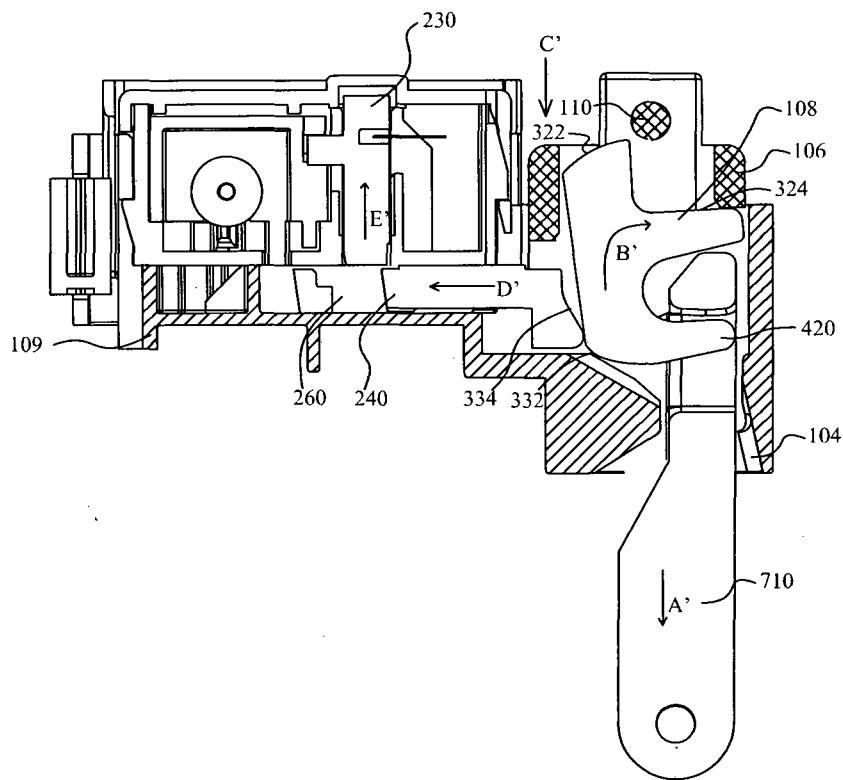


Fig. 7D

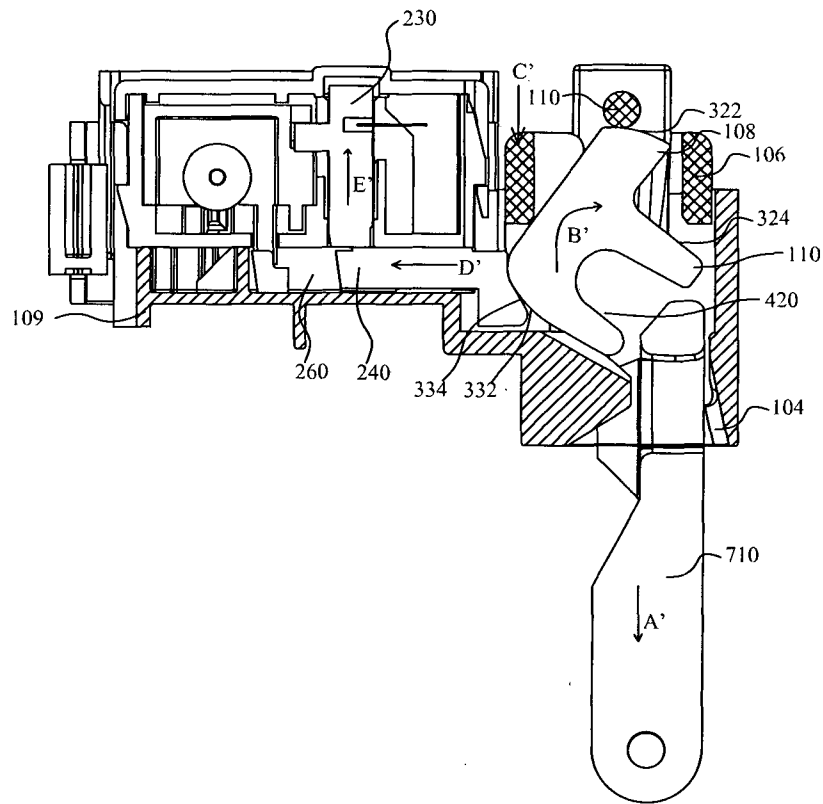


Fig. 7E

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2015/000703

A. CLASSIFICATION OF SUBJECT MATTER

INV. E05B47/06 A47L15/42 D06F37/42 E05C3/24
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E05B A47L D06F E05C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	the whole document	3-12
Y	----- WO 2013/181289 A1 (ILLINOIS TOOL WORKS INC) 5 December 2013 (2013-12-05)	3-5, 10-12
A	figures	1
Y	----- WO 2013/109585 A2 (ILLINOIS TOOL WORKS INC) 25 July 2013 (2013-07-25)	6
A	figures 3a,3b	1
Y	----- US 2011/203332 A1 (SUH ET AL) 25 August 2011 (2011-08-25)	7-9
A	figures 2,5	1
	----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

20 October 2015

Date of mailing of the international search report

29/10/2015

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Authorized officer

Van Beurden, Jason

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2015/000703

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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A	WO 2013/011528 A1 (ELETTROTECNICA ROLD SRL) 24 January 2013 (2013-01-24) the whole document -----	1,13
A	DE 10 2010 051518 A1 (EMZ HANAUER GMBH & CO KGAA) 16 May 2012 (2012-05-16) paragraphs [0027] - [0030]; figures 1,2 -----	1

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International application No

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