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(54) **Lock**

(57) Lock (10), comprising a lock case (11) having a front plate (12), a first latch (20) and a first transportation device (13) connected to the first latch for moving the first latch with respect to the front plate in a first linear direction of movement transverse to the front plate from a substantially retracted position or opening position to an extended position or locking position and vice versa, wherein the transportation device comprises a first and a second transportation member that connect the lock case to the first latch in series, wherein the first transportation member is rotatable about a first point of rotation

that is stationary with respect to the lock case, the second transportation member is rotatable about a second point of rotation that is stationary with respect to the first latch, and at a first and second distance, respectively, from the first and second point of rotation, respectively, the first and second transportation member are connected to each other so as to be mutually rotatable about a third point of rotation that is stationary with respect to the first and second transportation member.

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Description

BACKGROUND OF THE INVENTION

[0001] The invention relates to a lock, comprising a lock case having a front plate, a latch and a transportation device connected to the latch for moving the latch with respect to the front plate in a linear direction of movement transverse to the front plate.

[0002] A known lock of the above-mentioned type comprises a latch of which a part that is situated within the lock case is provided with a slot extending transverse to the direction of movement in which slot a pin extends that is eccentrically connected to a rotation part. As a result of rotation of the rotation part the pin slides through the slot, as a result of which the latch moves in and out of the front plate. Intensive use may cause the slot and to a larger degree the pin to wear away, which may cause play. The latch for in stance no longer fully retracts in the front plate or no longer functions smoothly, as a result of which a door can no longer be opened and closed properly. For burglars it may furthermore become easier to press the latch back into the lock case via the slit between the door and the door casing.

[0003] It is an object of the invention to provide a lock that is suitable for intensive use.

[0004] It is an object of the invention to provide a burglar-resistant lock.

[0005] It is an object of the invention to provide a lock that can be attached to left hand hung and right hand hung doors, wherein the natural direction of rotation of a key or another operation part with respect to the lock remains intact.

SUMMARY OF THE INVENTION

[0006] The invention provides, according to one aspect, a lock, comprising a lock case having a front plate, a first latch and a first transportation device connected to the first latch for moving the first latch with respect to the front plate in a first linear direction of movement transverse to the front plate from a substantially retracted position or opening position to an extended position or locking position and vice versa, wherein the transportation device comprises a first and a second transportation member that connect the lock case to the first latch in series, wherein the first transportation member is rotatable about a first point of rotation that is stationary with respect to the lock case, the second transportation member is rotatable about a second point of rotation that is stationary with respect to the first latch, and at a first and second distance, respectively, from the first and second point of rotation, respectively, the first and second transportation member are connected to each other so as to be mutually rotatable about a third point of rotation that is stationary with respect to the first and second transportation member.

[0007] The first and second transportation member

form the connection between the lock case and the first latch, wherein by using points of rotation within this connection the transportation device can be resistant against intensive use.

[0008] In one embodiment the first transportation device is adapted for in a second direction of movement moving the third point of rotation to a first straight connecting line of the first and second point of rotation at movement of the first latch from the retracted position to the extended position. The first and the second transportation member form a knee or elbow mechanism which at movement to the extended position moves into a stretched condition.

[0009] Preferably the first transportation device is adapted for in the second direction of movement moving the third point of rotation on or beyond the first straight connecting line at movement of the first latch from the retracted position to the extended position. The knee mechanism is in its stretched condition when the third point of rotation is situated on the first connecting line, in which way pressing the first latch into the retracted position from the outside can be counteracted.

[0010] Preferably the first transportation device comprises a first abutment for the first and/or second transportation member that is positioned for on or at a short distance beyond the first connecting line keeping the third point of rotation in a first end position. The abutment is able to keep the knee mechanism in said stretched condition, or in a slightly overstretched condition. In the latter case pressing the first latch into the retracted position from the outside can be made even more difficult.

[0011] In a simple embodiment the first abutment is provided at the first latch.

[0012] In one embodiment the first connecting line and the first direction of movement are at a first angle to each other, wherein the first angle preferably is an acute angle, preferably 0-10 degrees, preferably 0-5 degrees.

[0013] In a simple embodiment the first and second distance are substantially equal to each other.

[0014] In one embodiment in the first end position of the third point of rotation the second and third point of rotation are situated on a second straight line that extends substantially parallel to the first direction of movement.

[0015] In one embodiment in the first end position of the third point of rotation the first transportation member abuts the first abutment. The second and third point of rotation can then be situated on the second line.

[0016] The first transportation member can force the first latch to the extended position via the second transportation member when the first transportation member is pre-biased rotation-wise about the first point of rotation for pre-biasing the first latch in the direction of the extended position.

[0017] In one embodiment the transportation device comprises a locking for locking a movement of the third point of rotation away from the first end position. The locking can then maintain the said overstretched condition, even when for instance the lock is tapped against

in order to force it.

[0018] The locking preferably comprises a first locking member that is rotatable about a fourth point of rotation that is stationary with respect to the lock case, wherein the locking member comprises a first engagement member that is positioned to engage onto a first engageable member of the first and/or second transportation member, preferably at or near the third point of rotation. The locking member is then able to engage onto the first and/or second transportation member like a hook for instance to maintain the overstretched condition.

[0019] Preferably the first latch and the first locking member comprise blocking means that cooperate together for blocking a rotation of the first locking member beyond the first end position of the third point of rotation.

[0020] In one embodiment the transportation device comprises a third transportation member that is rotatable about a fifth point of rotation that is stationary with respect to the first or second transportation member, and that is movable at a distance from the fifth point of rotation according to a path determined within the lock case in order to contact an operation lip that can be swung within the lock case and is operationally connected to a first key cylinder at or outside the lock case. The third transportation member is able to convert the swinging motion of the operation lip in the motion of the first and second transportation member. In particular the third transportation member can be positioned to bring the knee mechanism into its overstretched condition, as a result of which the first latch moves to the retracted position.

[0021] In a simple embodiment the third transportation member comprises a projection that at least partially extends through a slot defining the path determined within the lock case. The determined path may coincide with the path of the swinging motion of the operation lip.

[0022] In one embodiment the first transportation device is placed at a side of the first latch defined by a first plane of symmetry of the first latch extending substantially parallel to the first direction of movement. The plane of symmetry may for instance be defined transverse to a longest longitudinal direction of the front plate.

[0023] Preferably the lock comprises a second transportation device for the first latch, wherein the second transportation device with respect to the first plane of symmetry is placed at the opposite side of the first transportation device, so that both transportation devices may contribute to the transportation and locking of the first latch.

[0024] In one embodiment the first transportation device and the second transportation device substantially have the same shape, preferably they are mirror symmetrically formed with respect to the first plane of symmetry. Due to the mirror symmetrical shape the cooperating first and second transportation device may contribute to guiding the first latch in the first direction of transportation.

[0025] Preferably the first and second transportation device are provided with synchronisation means for a

synchronous motion of the first and second transportation device, preferably having an opposite sense of rotation. The transportation devices can then be set into motion by setting one of the transportation devices into motion, after which the other transportation device follows synchronously. When both transportation devices are symmetrically provided with said third transportation members, the swinging motion of said operation lip can in both directions be converted into a movement of the first latch to the retracted position. The lock can then be used for both left hand hung and right hand hung doors, wherein the door can be opened by swinging the operation lip via a key swung in the natural direction of rotation. The natural direction of rotation for instance corresponds with moving the upper side of the key away from the front plate.

[0026] In one embodiment the first transportation members of the first and second transportation means both at a distance from the first point of rotation are provided with teeth that mesh for the synchronous motion of the first transportation members about the first points of rotation. The teeth can be meshed during the assembling of the lock.

[0027] Additionally or alternatively to guiding by the first and second transportation members the first latch may comprise two first guiding surfaces extending substantially parallel to each other and in the first direction of movement, which in between them confine a first guide positioned stationary in the lock case for guiding the first latch in the first direction of movement.

[0028] In one embodiment the fourth point of rotation of the locking member is situated substantially in the first plane of symmetry, wherein the locking member comprises a first engagement member on both sides of the first plane of symmetry, which engagement member depending on an anti-clockwise or clockwise rotation engages onto the first engagement member above or below the plane of symmetry. The locking member is able to lock or unlock in two directions of rotation, as a result of which for both left hand hung and right hand hung doors the rotation of the locking member can be driven by a key turned in the natural direction, namely with the upper side away from the front plate in order to unlock.

[0029] The desired natural direction can be set when the locking comprises a second locking member that is fixedly connected to the first locking member, wherein the second locking member comprises two spaced apart substantially oppositely oriented third abutments that are positioned to contact an operation lip placed between the third abutments and able to swing within the lock case, which lip is operationally connected to a second key cylinder at or beyond the lock case.

[0030] The desired natural direction can be set when the second locking member can be attached in two positions on the first locking member, wherein the position defines the locking direction of the locking with respect to the direction of movement of the lip against one of the third abutments.

[0031] In one embodiment of the lock the transportation device comprises a hand grip part that is movable with respect to the lock case, wherein the hand grip part is connected to a second guide extending within the lock case, which guide is positioned for by moving the hand grip part contacting a second engageable part of the first or second operation member and thus in the second direction of movement moving the third point of rotation away from the first end position.

[0032] In one embodiment the transportation device is adapted for moving the first latch from the retracted position to the extended position via an intermediate position or standby position defined in between, wherein the lock comprises a latch operation device for the first latch, wherein the latch operation device comprises a second latch that is movable with respect to the front plate substantially parallel to the first direction of movement between a substantially retracted position and an extended position or stand-by position, wherein the latch operation device is adapted for releasing a movement of the latch to the extended position by a movement of the operation member to the retracted position.

[0033] The intermediate position or stand-by position can be selected such that the first and second latch with the free end can be urged over a strike plate mounted in the door casing to the retracted position, after which due to the release the first latch can fall in an opening in the strike plate whereas the second latch remains abutting the strike plate. The free end of the first latch then projects further from the front plate than it does in the intermediate position, resulting in a secure locking of the door.

[0034] In one embodiment the transportation device and the latch operation device are adapted for movement of the first and second latch over parallel movement paths.

[0035] In one embodiment the transportation device and the latch operation device are adapted for a simultaneous motion of the first and second latch at a returning motion of the first latch to the retracted position, wherein the free ends of the first and second latch in the simultaneous motion preferably are at substantially the same distance from the front plate. When inadvertently touching the first latch the second latch is also urged back, thus preventing inadvertent release.

[0036] A relative movement between the first and second latch may because of the above-mentioned measures be difficult to accomplish. If a possible relative movement should occur at all, release of the first latch can to a certain degree be counteracted when the latch operation device is adapted for the release of the movement of the first latch after going through a lost motion between the first and second latch.

[0037] In one embodiment the first and second latch comprise at least one closing surface oriented transverse to the front plate and a retracting surface oriented diagonally to the front plate and away from a free end of the latch.

[0038] The retracting surface may realise the said re-

turning movement of the first and second latch along the strike plate.

[0039] Preferably in the extended position of the first latch the entire retracting surface and two closing surfaces that are situated parallel to each other are largely situated beyond the lock case. In the intermediate position the transition of the retracting surface and the closing surface, which transition extends at a distance from the free end of the latch, may be situated only a few millimetres from the front plate.

[0040] In one embodiment the latch operation device comprises a path limiter that is connected to the first latch and which with respect to the first latch can be translated transverse to the first direction of movement, wherein a portion of the path limiter can abut a fourth abutment limiting the position of the first latch to the intermediate position, and which due to translation with respect to the first latch can be brought over the fourth abutment.

[0041] Preferably the latch operation device comprises a converter for converting the motion of the second latch to the translation of the path limiter.

[0042] The aspects and measures described in this description and the claims of the application and/or shown in the drawings of this application may where possible also be used individually. Said individual aspects, and other aspects may be the subject of divisional patent applications relating thereto. This particularly applies to the measures and aspects described per se in the sub claims.

SHORT DESCRIPTION OF THE DRAWINGS

[0043] The invention will be elucidated on the basis of a number of exemplary embodiments shown in the attached drawings, in which:

Figure 1 shows an isometric view of a rim lock having a latch mechanism according to the invention;

Figure 2 shows the rim lock according to figure 1, wherein the cover has been removed;

Figure 3 shows the rim lock according to figure 1 or 2, wherein for the purpose of illustrating the latch mechanism, a part of the side wall underneath the cover of the lock case has been removed;

Figure 4 shows the rim lock according to figure 3, wherein the latch mechanism is in its end position;

Figure 5 shows the rim lock according to figure 4, wherein the latch mechanism has been locked in its end position;

Figure 6 shows a rear view of the rim lock according to figure 1;

Figure 7 shows the rim lock according to figure 6,

wherein for the purpose of illustrating the latch mechanism a mounting plate has been removed;

Figure 8 shows the rim lock according to figure 7, wherein for the purpose of illustrating the latch mechanism a part for the latch release has been removed;

Figure 9 shows the rim lock according to figure 8, wherein the latches prior to a locked position of the latch mechanism, have been pressed to the lock case or have been fully retracted;

Figure 10 shows the rim lock according to figure 8, wherein the latch mechanism is in its end position; and

Figure 11 shows an operation member for locking and moving the latch mechanism.

DETAILED DESCRIPTION OF THE DRAWINGS

[0044] Figure 1 shows a rim lock 10 having a metal lock case 11 having a front plate 12 for attachment to a door that is not further shown, wherein the projecting part of the front plate 12 is placed flush with the front side or leaf of the door. In the following description a left hand hung door, opening to the inside is taken as starting point, wherein the rim lock 10 in the orientation according to figures 1-5 has been attached to the door leaf positioned on the right. However, turned in opposite orientation, the rim lock 10 can be mounted on the left leaf of a right hand hung door as well.

[0045] The rim lock 10 comprises a pull knob 13 movable in pull direction A with respect to the lock case 11 for moving a metal main latch 20 (first latch) with respect to the front plate 12 in a linear direction of movement B transverse to the front plate 12. Under the main latch 20, the rim lock 10 comprises a metal auxiliary latch 60 which according to a release mechanism explained further below, defines the ultimate position of the main latch 20. The lock case 11 and the latches 20, 60 in this example are made of a zinc-aluminium alloy, such as Zakac/Zamak.

[0046] The main latch 20 comprises a closing surface 21 and a rear surface 23 extending parallel to each other in the direction of movement B, and a run-on surface 22 oriented diagonally to the direction of movement B. The auxiliary latch 60 comprises a front surface 61, a rear surface 63 and a run-on surface 62 extending parallel to the above-mentioned surfaces 21, 23 and 22 of the main latch 20.

[0047] At its front side the rim lock 10 is provided with an interchangeable key cylinder 14 for locking the main latch 20 from the inside of the door, and a cover 15 for a fine finish of the lock case 11. The cover 15 comprises a window 31 for an indicator 54 indicating the condition of the locking of the pull knob 13.

[0048] Figure 2 shows the rim lock 10 without the cover

15. At its front side the lock case 11 is provided with a side wall 17 having a fastening tube 18 for the key cylinder 14, and a circumferential edge 16 offset to the inside for placing the cover 15. The key cylinder 14 is shown in both the built-in position and the position in which it has been taken out.

[0049] The key cylinder 14 comprises a circumferential wall 33 having a screw 32 at the insertion side. After inserting the key cylinder 14 in the fastening tube 18 the screw 32 can be turned with a screwdriver via a sideward opening 19. The screw 32 may then partially come out of the circumferential wall 33 in order to engage onto the wall of the opening 19, as a result of which the key cylinder 14 is secured stationary and rotation-fixedly with respect to the fastening tube 18. The key cylinder 14 comprises an operation end 49, which by means of an inserted key can be rotated anti-clockwise and clockwise from an intermediate position in direction K1, K2, and which extends within the lock case 11 in a ring 130 (figure 11) for locking and unlocking the main latch 20.

[0050] Figures 3, 4 and 5 show the rim lock 10 of which the side wall 17 has been partially cut away. Figure 6 shows the inside from the rear side of the rim lock 10 in the position according to figure 3. The rim lock 10 comprises a latch mechanism 40 for operating the main latch 20. The latch mechanism 40 is largely confined between the side wall 17 and a mounting plate 35 attached within the lock case 11. The mounting plate 35 is secured to internal threaded bushes 37 of the lock case 11 by means of screws 36. In figure 7 the mounting plate 35 is left out, in figure 8 a part of a release mechanism for the main latch 20 to be discussed further below, is left out.

[0051] As shown in figure 8 the main latch 20 has a substantially mirror symmetrical shape with respect to plane of symmetry X transverse to the plane of the figure. The main latch 20 at the inside of the lock case 11 comprises two linear guides 58 extending parallel to the direction of movement B and having linear guiding surfaces 24 extending parallel to each other and parallel to the direction of movement B. Between the linear guiding surfaces 24 an insertion 29 is confined, which is secured stationary in the lock case 11, for limiting the movement of the main latch 20 to its linear direction of movement B in cooperation with the linear guiding surfaces 24. The linear guides 58 each comprise an abutment surface 39 transverse to the linear guiding surface 24 that is positioned recessed with respect to the rear surface 23 of the main latch 20. The linear guides 58 at their end comprise a support surface 38 facing away from the plane of symmetry X. From the abutment surfaces 39 two integrally formed hinge pins 30 (second point of rotation) project. The main latch 20 at the upper side comprises an abutment 137 which in the ultimate position of the latch 20 (according to figures 4 and 5) may get into contact with the inner surface of the front plate 12.

[0052] The latch mechanism 40 comprises two first transportation members 41 (first transportation member) which via two second transportation members 47 (sec-

ond transportation member) engage onto the two hinge pins 30 of the main latch 20. The transportation members 41, 47 are substantially mirror symmetrically formed with respect to the plane of symmetry X of the main latch 20 extending through the centre of the insertion 29.

[0053] At the front and rear side, the first transportation members 41 comprise an integrally formed first stepped hinge pin 42 (first point of rotation) which at the ends extend rotatably in holes in the side wall 17 and the mounting plate 35, respectively, a first abutment surface 55 having an integrally formed second hinge pin 45 (fifth point of rotation) projecting therefrom, and a second abutment surface 43 positioned recessed with respect to the first abutment surface 55, having an integrally formed third hinge pin 44 (third point of rotation) projecting therefrom. At the third hinge pins 44 the first transportation members 41 are bounded by a rounded-off edge area 53 for a cooperation, discussed further below, with the support surfaces 38 of the linear guides 58.

[0054] At the ends spaced apart from the stepped hinge pins 42, the first transportation members 41 comprise meshing teeth 46 which ensure a simultaneous rotation that is synchronous with respect to the plane of symmetry X, of the first transportation members 41 with an opposite sense of rotation about the centre line of the first hinge pins 42.

[0055] The second transportation members 47 have an elongated shape and at the ends comprise two holes in which the hinge pin 30 of the main latch 20 and the third hinge pin 44 of the first transportation member 41 are rotatably accommodated. The second transportation members 47 are then situated on the abutment surface 39 of the linear guides 58 and the second abutment surface 43 of the first transportation members 41.

[0056] As shown in figures 8 and 9 the first transportation members 41 and the second transportation members 47 according to notional connecting lines G and H, respectively, form a knee mechanism between the centre lines of the hinge pins 30, 42, 44, wherein the length of the connecting lines G and H substantially equal each other. As shown in figure 10 notional connecting lines I extend between the hinge pins 30, 42, which are at an acute angle of approximately 4.6 degrees to the notional lines X1, X2 that extend parallel to the plane of symmetry X through the hinge pins 30 of the main latch 20.

[0057] Depending on the position of the first and second transportation members 41, 47 the centre line of the second hinge pins 44 sits at the main latch side of the line I according to figure 10, on the line I, or at the side of line I facing away from the main latch 20 according to figures 3-9. At the main latch side the second transportation members 47 and thus the first transportation members 41 may reach a blocked end position, wherein the edge areas 53 of the first transportation members 41 rest on the support surfaces 38 of the linear guides 58. In said blocked end position the free end of the main latch 20 can no longer be pressed back in the direction of the front plate 12.

[0058] The latch mechanism 40 comprises two transfer arms 50 (third transportation member) which each at an end are movably connected to the second hinge pins 45, and which at the opposite end are provided with an integrally formed pin 51 confined in a curved slot 56 in the mounting plate 35. The transfer arms 50 abut the first abutment surface 55 of the first transportation member 41. The slot 56 is mirror symmetrical with respect to the plane of symmetry X, and has a centre portion having a substantially constant radius, and two substantially straight end portions. By swinging the first transportation members 41, the integrally formed pins 51 can move synchronously and symmetrically through the curved slot 56 according to similarly formed paths Q1, Q2.

[0059] The distance between the first abutment surface 55 and the second abutment surface 43 transverse to the plane of figure 8 is larger than the thickness of the second transportation members 47, as a result of which the transfer arms 50 and the second transportation members 47 cannot touch each other. In the lock case 11 a wound spring 120 is accommodated which pre-biases the uppermost first transportation member 41 at the upper side of the first hinge pin 42 rotation-wise in the direction of the front plate 12.

[0060] As shown in figures 3, 4 and 5 the latch mechanism 40 comprises an elongated plate 70 which at one end is connected to the pull knob 13. The plate 70 extends moveably underneath the pull knob 13 through an opening 74 in the side wall of the lock case 11. The elongated plate 70 comprises a long hole 71 extending in the pulling direction A. The first hinge pin 42 extends through this long hole 71 to limit the freedom of movement of the pull knob 13 in cooperation with the opening 74 to the direction and substantially the length of the long hole 71.

[0061] The elongated plate 70 comprises a curved end 72 which is sidewardly oriented in the plate surface, and of which the side edge defines a circular curved transportation surface 73. The transportation surface 73 abuts a transportation pin 48 which is integrally formed at the lowermost first transportation member 41. The centre line of said pin 48 substantially coincides with the centre line of the second hinge pin 45. As shown in figure 4 translation of the pull knob 13 in direction A away from the lock case 11 moves the transportation pin 48 in direction N1 along the transportation surface 73, as a result of which this pin 48 and thus the lowermost first transportation member 41 is swung in direction N2 about the centre line of the first hinge pin 42. Due to the teeth 46 the uppermost transportation member 41 moves along synchronously.

[0062] As shown in figures 3, 4 and 5 the latch mechanism 40 comprises a semicircular locking disk 90 having a centre hole 94 (fourth point of rotation) through which a hinge pin, that is not further shown, accommodated stationary in the lock case 11, has been inserted for swinging the locking disk 90 within the lock case 11 from an intermediate position in directions P1, P2 about the hinge pin that is not shown. Means are provided which

urge the locking disk 90 to the stable intermediate position or the two stable end positions. The locking plate 90 comprises a straight long hole 91 having an open side for accommodation of a blocking pin 97 integrally formed at the main latch 20, and two recesses 92a, 92b formed on both sides equidistant from the centre hole 94, for accommodation of a locking pin 98a, 98b integrally formed at the first transportation members 41. The centre lines of said locking pins 98a, 98b substantially coincide with the centre lines of the third hinge pins 44.

[0063] The blocking pin 97 keeps the locking disk 90 in its intermediate position when it is within the straight long hole 91. In this intermediate position both locking pins 98a, 98b are out of reach of the recesses 92a, 92b. The position of the blocking pin 97 is selected such that the blocking pin 97 is outside of the straight long hole 91 when the edge areas 53 of the first transportation members 47 abut the support surfaces 38 of the main latch 20. As a result the locking disk 90 can only lock the transportation members 41, 47 when they have already blocked the main latch 20, that means when the edge areas of the first transportation members 41 abut the support surfaces 38 of the linear guides 58.

[0064] A Y-shaped engagement plate 93 is placed on the locking plate 90, the engagement plate 93 having a centre hole 95 for the stationary hinge pin that is not shown. The engagement plate 93 comprises a left and a right projecting abutment 96A, 96B which are spaced apart from each other, and opposite thereof a slim end 99 that is confined beneath the indicator 54. The plastic indicator 54 is accommodated in a long hole 131 provided in the side wall 17, which hole has a constant radius with respect to the centre holes 94, 95. On the sight side over the length the indicator 54 consecutively comprises a red colour surface 54a, a central green colour surface 54b and again a red colour surface 54c. Other distinguishing colour combinations are also possible, such as black-white-black. At the bottom side beneath each colour surface the indicator 54 comprises a placement pin 135 with which the indicator 54 has been secured in three holes 136 in the locking disk 90. The pin 135 underneath the green colour surface 54a also extends through a hole in the slim end 99 to let the locking plate 90 move along with the engagement plate 93. In the attached condition the indicator 54 is kept confined by the cover 15.

[0065] The rim lock 10 comprises an operation assembly 121 for locking, unlocking and operating the latch mechanism 40. The operation assembly 121, shown in detail in figure 11, comprises an eccentric plate 122 to which a hollow bush 123 having a hexagonal accommodation space has been integrally formed. The eccentric plate 122 forms a part of a rotation transmission to a key cylinder at the outside of the door. The eccentric plate 122 abuts the outside of the mounting plate 35 (figure 6). A first ring 125 is situated around the bush 123, which ring is provided with a transportation lip 127 and two first abutment edges 126 curved along with the annular shape, which abutment edges are confined between the

two similarly shaped second abutment edges on the bush 123 and the eccentric plate 122. The transportation lip 127 abuts the mounting plate 35, and is movable over a recess 34 in the insertion 29.

[0066] The operation assembly 121 further comprises a stepped shaft 134 having a transitional portion 139 to a hexagonal end 133 which fits in the hexagonal accommodation space of the bush 123. The transitional portion 139 then remains free from the bush 123. The stepped shaft 134 comprises a cylindrical inner cavity 132 and a radially extending outer unlocking lip 128 at the level of the inner cavity 132. At the end surface of the shaft 134 a second ring 130 having a projecting inner unlocking lip 129 is situated. The second ring 130 is kept in its place by confinement between four cams 140 that are integrally moulded at the inside of the side wall 17.

[0067] The inner unlocking lip 129 is able to swing in its plane in direction K1, K2 about the centre line O with respect to the outer unlocking lip 128. The outer unlocking lip 128 swings in directions K3, K4 synchronously with the eccentric plate 122 in direction M1, M2. The abutment edges 124, 126 allow a limited swing of the eccentric plate 122 in direction M1, M2 without the transportation lip 127 moving along with it. After said lost motion the transportation lip 127 moves in direction L1, L2 along with the eccentric plate 122.

[0068] In the mounted condition the unlocking lips 128, 129 can contact the abutments 96a, 96b of the Y-shaped engagement plate 93 in directions K1-K4. The transportation lip 127 can contact the front side of one of the transfer arms 50 in directions L1, L2.

[0069] In the mounted condition the operation end 49 of the key cylinder 14 extends through the second ring 130 in the inner cavity 132, wherein an inner lip 137 extends in a slot 141 in the operation end 49. The second ring 130 and thus the inner unlocking lip 129 can swing independent of the eccentric plate 122 in directions K1, K2 by means of the key cylinder 14.

[0070] Considered from the key cylinder 14 at the inside of the door, the inner unlocking lip 129 can be swung clockwise in direction K1 or anti-clockwise in direction K2, and considered from the key cylinder that is not shown at the outside of the door the inner unlocking lip 128 can be swung anti-clockwise in direction K3 and clockwise in direction K4, in order to contact the lowermost abutment 96b and the uppermost abutment 96a, respectively, of the Y-shaped engagement plate 93. In response thereto the locking disk 90 rotates from the intermediate position in direction P1 with the uppermost recess 92a towards the uppermost locking pin 98a according to figure 4, or the locking disk 90 rotates from the locking position in the direction P2 back to the intermediate position according to figure 3, respectively. The indicator 54, via the window 31, shows the red or the green colour surface 54b, 54a, respectively. Therefore the main latch 20 is blocked by a natural sense of rotation of the key with respect to the lock, namely with the upper side in the direction of the front plate 12 when blocking the

main latch 20. The blocking position is indicated as such by the red colour.

[0071] The lost motion between swinging the eccentric plate 122 and the transportation lip 127 ensures that the locking disk 90 first uncouples prior to the setting the main latch 20 into motion. Due to the symmetry with respect to the plane of symmetry X the transportation lip 127 is able to operate one of the two transfer arms in both directions of rotation L1, L2, after the lost motion as a result of which the rim lock 10 can be used for both left hand hung and right hand hung doors. The main latch 20 will at all times retract when at the outside of the door a key is turned according to a natural sense of rotation with the upper side away from the front plate 12 in order to open the door.

[0072] The natural sense of rotation needs to be opposite indeed for a right hand hung door, because the lock 10 is then attached to the door the other way round. In that case the Y-shaped engagement plate 93 has to be secured below the upper red colour surface 54b with the pin 135, as a result of which the then lower abutment 96a contacts the unlocking lips 128, 129 swinging from the centre point in direction K2, K4 in order to lock the main latch 20. The locking pin 98b is then received in the recess 92b of the locking disk 90. Then the abutment 96b situated on top may contact the unlocking lips 128, 129 swinging from the centre point in direction K1, K3 in order to unlock the main latch 20 again.

[0073] As shown in figure 8 the auxiliary latch 60 comprises a linear guide 65 having a first abutment 64 projecting therefrom that may abut the inner side of the front plate 12, and a second abutment 66 that may abut the rear edge 67 of the main latch 20. Because of the second abutment 66 the auxiliary latch 60 with the free end can never move further than the free end of the main latch 20. The auxiliary latch 60 on the one hand with a straight side abuts the straight bottom side of the main latch 20, and on the other hand with the linear guide 65 abuts a stationary stop that is not shown in the lock case 11, as a result of which the auxiliary latch 60 can only move up and down in a linear direction J parallel to the direction B. The linear guide 65 comprises a run-on surface 69 that is diagonally oriented to the direction of movement J, which run-on surface 69 forms a part of the transition to a lowered abutment surface 68 of the linear guide 65. The auxiliary latch 60 is pre-biased to the outside by means of a spring 75.

[0074] As shown in figure 7 a blocking plate 80 is situated on the main latch 20, wherein the two hinge pins 30 extend through two long holes 81 in the blocking plate 80 in order to limit the freedom of movement of the blocking plate to a short translatory stroke transverse to the direction of movement B of the main latch 20. The blocking plate 80 comprises an upright, elongated blocking lip 83 extending between the plane of symmetry X and the upper side of the blocking plate 80. From an opening in the centre of the blocking plate 80 a support lip 82 is formed which in an elongated spring chamber 76 (figure

8) extends in the main latch 20.

[0075] In the spring chamber 76 a compression spring 77 is confined which presses against the support lip 82 and the opposite short side of the spring chamber 76 to pre-bias the blocking plate 80 towards the auxiliary latch 60. The lower edge of the blocking plate 80 may as a result be held partially above the lowered abutment surface 68 of the auxiliary latch 60. The inclined run-on surface 69 is positioned to contact a straight corner 138 of the blocking plate 80, which corner is oriented towards the auxiliary latch 60, as a result of which the blocking plate 80 can be moved upwards counter the pre-bias with respect to the main latch 20 by moving the auxiliary latch 60 in direction J to the lock case 11.

[0076] As shown in figure 6 the blocking plate 80 is movably confined behind a confinement lip 84 at the mounting plate 35. The confinement lip 84 at the upper side comprises a first guide edge 86 which via an abutment 88b oriented transverse thereto merges into a second guide edge 87 situated higher. The guide edges 86, 87 extend in the direction of movement B of the main latch 20. The compression spring 77 keeps the lower end of the blocking lip 83 in contact with the first or second guide edge 86, 87, depending on the position of the main latch 20 with respect to the front plate 12.

[0077] In the extended position or stand-by position of the auxiliary latch 60, in which the first abutment 64 abuts the inner surface of the front plate 12, the blocking lip 83 can only move over a limited track B1 between the abutment 88b and the side edge of the mounting plate 35 situated opposite therefrom, as a result of which the main latch 20 is able to move over the same limited track B1 between a retracted position shown in figure 9, and a stand-by position shown in figures 1-3, 6. In the stand-by position the run-on surfaces 22, 62 of the main latch and the auxiliary latch are outside of the front plate 12, the transition to the rear surfaces 23, 63 being only a few millimetres from the front plate. In this position the main latch 20 and the auxiliary latch 60 can be pressed to the inside by moving the run-on surfaces 22, 62 against a front plate of a strike case in the rebate for the door.

[0078] In the retracted position of the auxiliary latch 60 as shown in figures 4 and 5, the blocking lip 83 is able to move over the stop 88b, as a result of which the blocking lip 83 is able to move over a longer track B2 between the front plate 12 and the side edge of the mounting plate 35 situated opposite therefrom. As a result the main latch 20 can also move over the same track B2, as a result of which the edge areas 53 of the first transportation members 41 will abut the support surfaces 38 of the linear guides 58. This position is shown in figure 4 and 5. In this position the main latch 20 extends deeply and blocked in the said strike case, whereas the auxiliary latch 60 still abuts the front plate of the strike case in order to make release to the blocked position of the main latch 20 possible.

[0079] The above description is included to illustrate the operation of exemplary embodiments of the invention

and not to limit the scope of the invention. Starting from the above explanation many variations that fall within the spirit and scope of the present invention will be evident to an expert.

Claims

1. Lock, comprising a lock case having a front plate, a first latch and a first transportation device connected to the first latch for moving the first latch with respect to the front plate in a first linear direction of movement transverse to the front plate from a substantially retracted position or opening position to an extended position or locking position and vice versa, wherein the transportation device comprises a first and a second transportation member that connect the lock case to the first latch in series, wherein the first transportation member is rotatable about a first point of rotation that is stationary with respect to the lock case, the second transportation member is rotatable about a second point of rotation that is stationary with respect to the first latch, and at a first and second distance, respectively, from the first and second point of rotation, respectively, the first and second transportation member are connected to each other so as to be mutually rotatable about a third point of rotation that is stationary with respect to the first and second transportation member.
2. Lock according to claim 1, wherein the first transportation device is adapted for in a second direction of movement moving the third point of rotation to a first straight connecting line of the first and second point of rotation at movement of the first latch from the retracted position to the extended position.
3. Lock according to claim 2, wherein the first transportation device is adapted for in the second direction of movement moving the third point of rotation on or beyond the first straight connecting line at movement of the first latch from the retracted position to the extended position, wherein the first transportation device preferably comprises a first abutment for the first and/or second transportation member that is positioned for on or at a short distance beyond the first connecting line keeping the third point of rotation in a first end position, wherein the first abutment preferably is provided at the first latch.
4. Lock according to claim 2 or 3, wherein the first connecting line and the first direction of movement are at a first angle to each other, wherein the first angle preferably is an acute angle, preferably 0-10 degrees, preferably 0-5 degrees.
5. Lock according to any one of the preceding claims, wherein the first and second distance are substan-

tially equal to each other.

6. Lock according to any one of the claims 3-5, wherein in the first end position of the third point of rotation the second and third point of rotation are situated on a second straight line that extends substantially parallel to the first direction of movement.
7. Lock according to any one of the claims 3-6, wherein in the first end position of the third point of rotation the first transportation member abuts the first abutment.
8. Lock according to any one of the preceding claims, wherein the first transportation member is pre-biased rotation-wise about the first point of rotation for pre-biasing the first latch in the direction of the extended position.
9. Lock according to any one of the claims 3-8, wherein the transportation device comprises a locking for locking a movement of the third point of rotation away from the first end position, wherein the locking preferably comprises a first locking member that is rotatable about a fourth point of rotation that is stationary with respect to the lock case, wherein the locking member comprises a first engagement member that is positioned to engage onto a first engagement member of the first and/or second transportation member, preferably at or near the third point of rotation, wherein the first latch and the first locking member preferably comprise blocking means that cooperate together for blocking a rotation of the first locking member beyond the first end position of the third point of rotation.
10. Lock according to any one of the preceding claims, wherein the transportation device comprises a third transportation member that is rotatable about a fifth point of rotation that is stationary with respect to the first or second transportation member, and that is movable at a distance from the fifth point of rotation according to a path determined within the lock case in order to contact an operation lip that can be swung within the lock case and is operationally connected to a first key cylinder at or outside the lock case, wherein the third transportation member preferably comprises a projection that at least partially extends through a slot defining the path determined within the lock case.
11. Lock according to any one of the preceding claims, wherein the first transportation device is placed at a side of the first latch defined by a first plane of symmetry of the first latch extending substantially parallel to the first direction of movement, wherein the lock preferably comprises a second transportation device for the first latch, wherein the second transportation

device with respect to the first plane of symmetry is placed at the opposite side of the first transportation device, wherein the first transportation device and the second transportation device preferably substantially have the same shape, preferably mirror symmetrically formed with respect to the first plane of symmetry.

12. Lock according to claim 11, wherein the first and second transportation device are provided with synchronisation means for a synchronous motion of the first and second transportation device, preferably having an opposite sense of rotation, wherein, preferably the first transportation members of the first and second transportation means both at a distance from the first point of rotation are provided with teeth that mesh for the synchronous motion of the first transportation members about the first points of rotation.
13. Lock according to any one of the preceding claims, wherein the first latch comprises two first guiding surfaces extending substantially parallel to each other and in the first direction of movement, which in between them confine a first guide positioned stationary in the lock case for guiding the first latch in the first direction of movement.
14. Lock according to any one of the claims 11-13, when depending on claim 9, wherein the fourth point of rotation of the locking member is situated substantially in the first plane of symmetry, wherein the locking member comprises a first engagement member on both sides of the first plane of symmetry, which engagement member depending on an anti-clockwise or clockwise rotation engages onto the first engagement member above or below the plane of symmetry, wherein the locking preferably comprises a second locking member that is fixedly connected to the first locking member, wherein the second locking member comprises two spaced apart substantially oppositely oriented third abutments that are positioned to contact an operation lip placed between the third abutments and able to swing within the lock case, which lip is operationally connected to a second key cylinder at or beyond the lock case, wherein the second locking member preferably can be attached in two positions on the first locking member, wherein the position defines the locking direction of the locking with respect to the direction of movement of the operation lip against one of the third abutments.
15. Lock according to any one of the claims 2-14, wherein the transportation device comprises a hand grip part that is movable with respect to the lock case, wherein the hand grip part is connected to a second guide extending within the lock case, which guide is positioned for by moving the hand grip part contact-

ing a second engageable part of the first or second operation member and thus in the second direction of movement moving the third point of rotation away from the first end position.

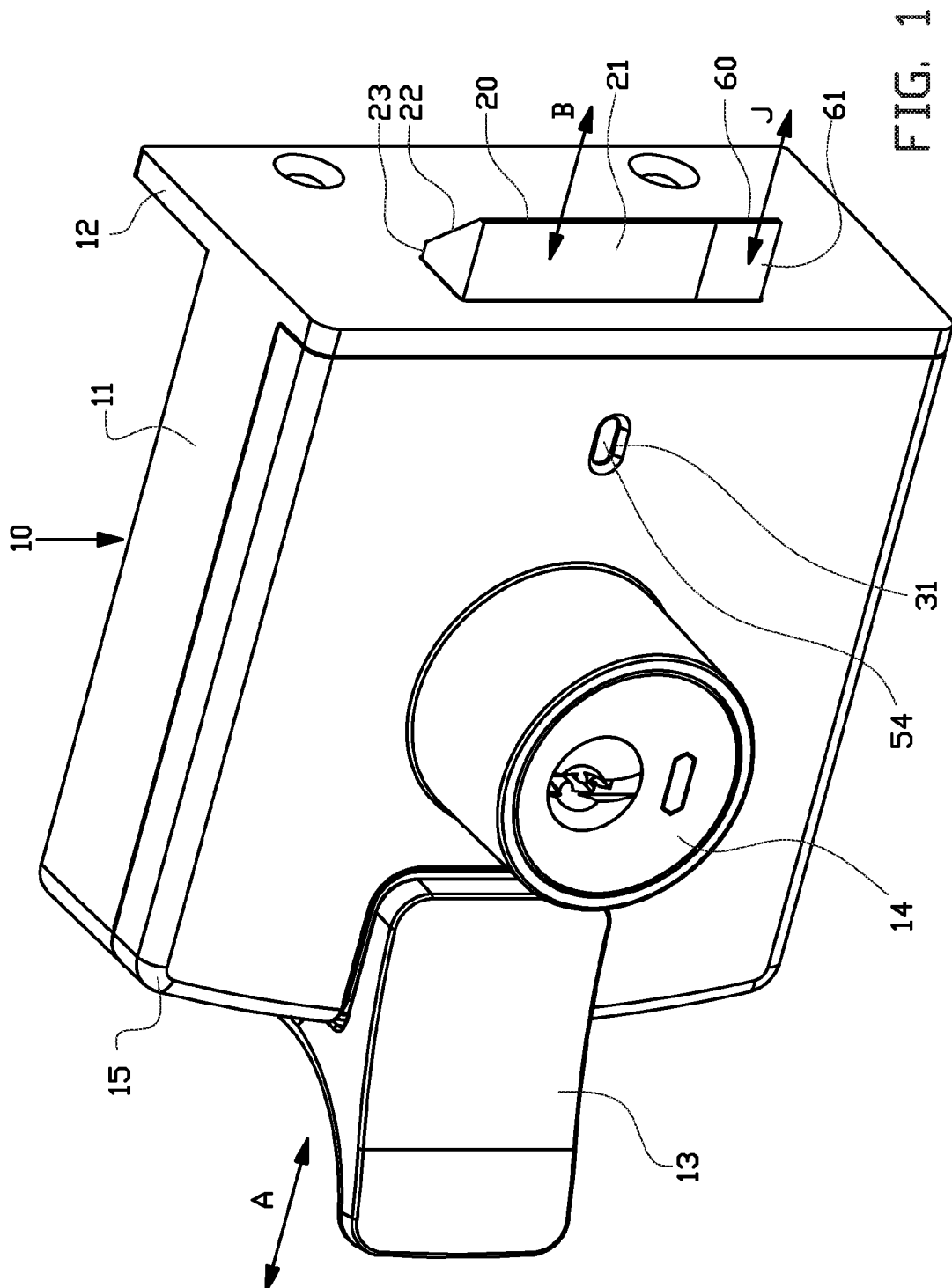
16. Lock according to any one of the preceding claims, wherein the transportation device is adapted for moving the first latch from the retracted position to the extended position via an intermediate position or standby position defined in between, wherein the lock comprises a latch operation device for the first latch, wherein the latch operation device comprises a second latch that is movable with respect to the front plate substantially parallel to the first direction of movement between a substantially retracted position and an extended position or stand-by position, wherein the latch operation device is adapted for releasing a movement of the latch to the extended position by a movement of the operation member to the retracted position.
17. Lock according to claim 16, wherein the latch operation device is adapted for releasing the movement of the first latch from the retracted position to the extended position by a relative movement of the first latch with respect to the second latch.
18. Lock according to claim 16 or 17, wherein the latch operation device is adapted for limiting a movement of the first latch to a movement between the retracted position and the intermediate position when the free ends of the first and second latch are substantially at the same distance from the front plate.
19. Lock according to any one of the claims 16-18, wherein the latch operation device is adapted for movement of the second latch transverse to the front plate.
20. Lock according to any one of the claims 16-19, wherein the transportation device and the latch operation device are adapted for movement of the first and second latch over parallel movement paths.
21. Lock according to any one of the claims 16-20, wherein the transportation device and the latch operation device are adapted for a simultaneous motion of the first and second latch at a returning motion of the first latch to the retracted position.
22. Lock according to claim 21, wherein the free ends of the first and second latch in the simultaneous motion are at substantially the same distance from the front plate.
23. Lock according to any one of the claims 16-22, wherein the latch operation device is adapted for the release of the movement of the first latch after going

through a lost motion between the first and second latch.

24. Lock according to any one of the claims 16-23, wherein the first and second latch are adjacent to each other. 5
25. Lock according to any one of the claims 16-24, wherein the first and second latch are positioned adjacent to each other in a longitudinal direction of the front plate. 10
26. Lock according to any one of the claims 16-25, wherein the second latch in the longitudinal direction of the front plate is smaller than the first latch. 15
27. Lock according to any one of the claims 16-26, wherein the latch and the operation member define a common latch shape or latch contour. 20
28. Lock according to any one of the claims 16-27, wherein the first and second latch together define a divided latch.
29. Lock according to any one of the claims 16-28, wherein the first and second latch comprise at least one closing surface oriented transverse to the front plate and a retracting surface oriented diagonally to the front plate and away from a free end of the latch. 25
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30. Lock according to claim 29, wherein in the extended position of the first latch the entire retracting surface and two closing surfaces that are situated parallel to each other are largely situated beyond the lock case. 35
31. Lock according to any one of the claims 16-30, wherein the latch operation device comprises a path limiter that is connected to the first latch and which with respect to the first latch can be translated transverse to the first direction of movement, wherein a portion of the path limiter can abut a fourth abutment limiting the position of the first latch to the intermediate position, and which due to translation with respect to the first latch can be brought over the fourth abutment. 40
45
32. Lock according to claim 31, wherein the latch operation device comprises a converter for converting the motion of the second latch to the translation of the path limiter. 50
33. Lock, comprising a lock case and a key cylinder that is at least partially accommodated in an accommodation space of the lock case that is intended for the key cylinder, wherein the key cylinder comprises an outer wall and a fastening screw that can be rotated in and out of said outer wall, and the accommodation space is bounded by an inner wall for abutment 55

against the outer wall, wherein the inner wall is provided with an opening for accommodation of the fastening screw.

34. Lock according to any one of the preceding claims, designed as rim lock.



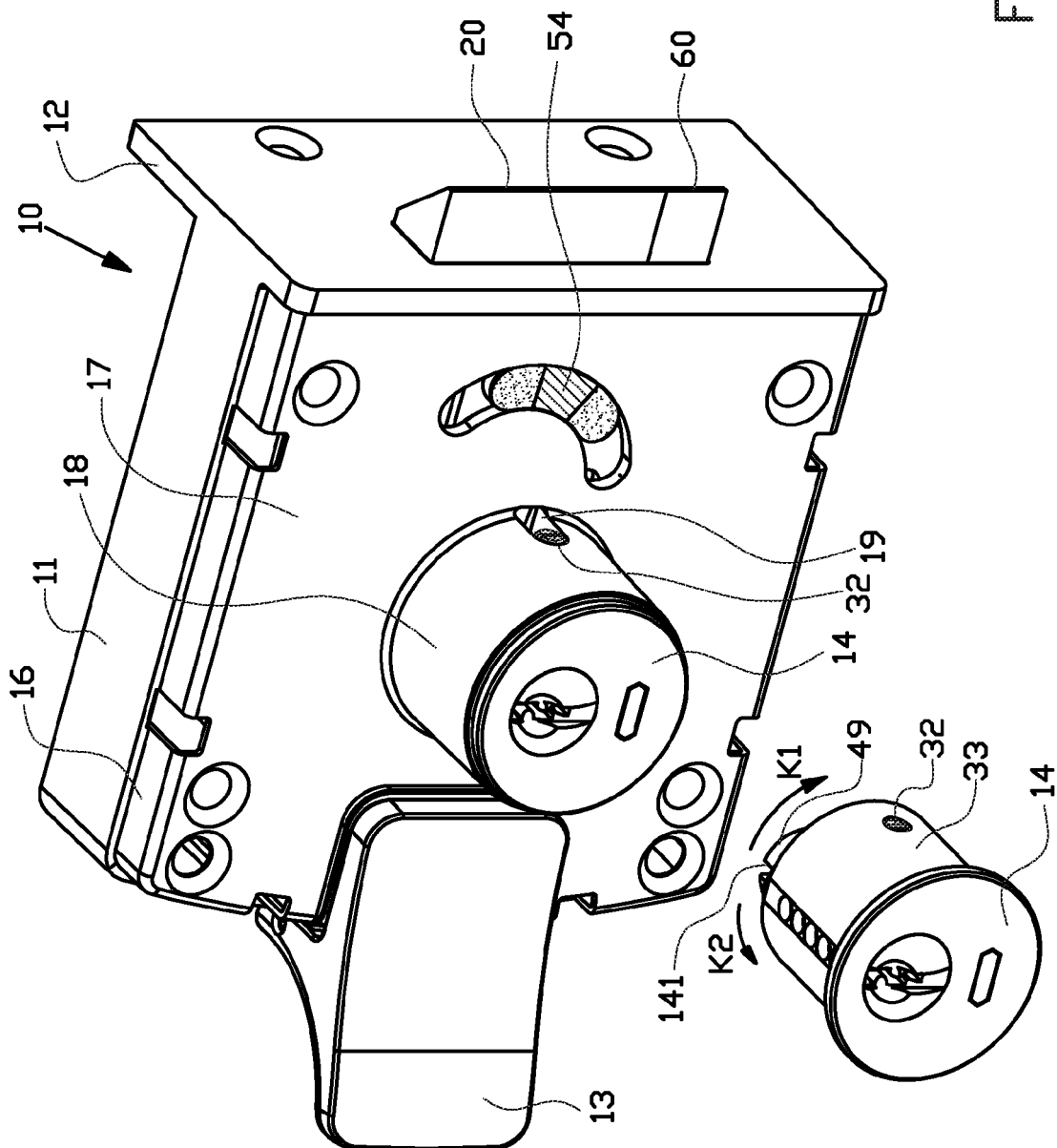
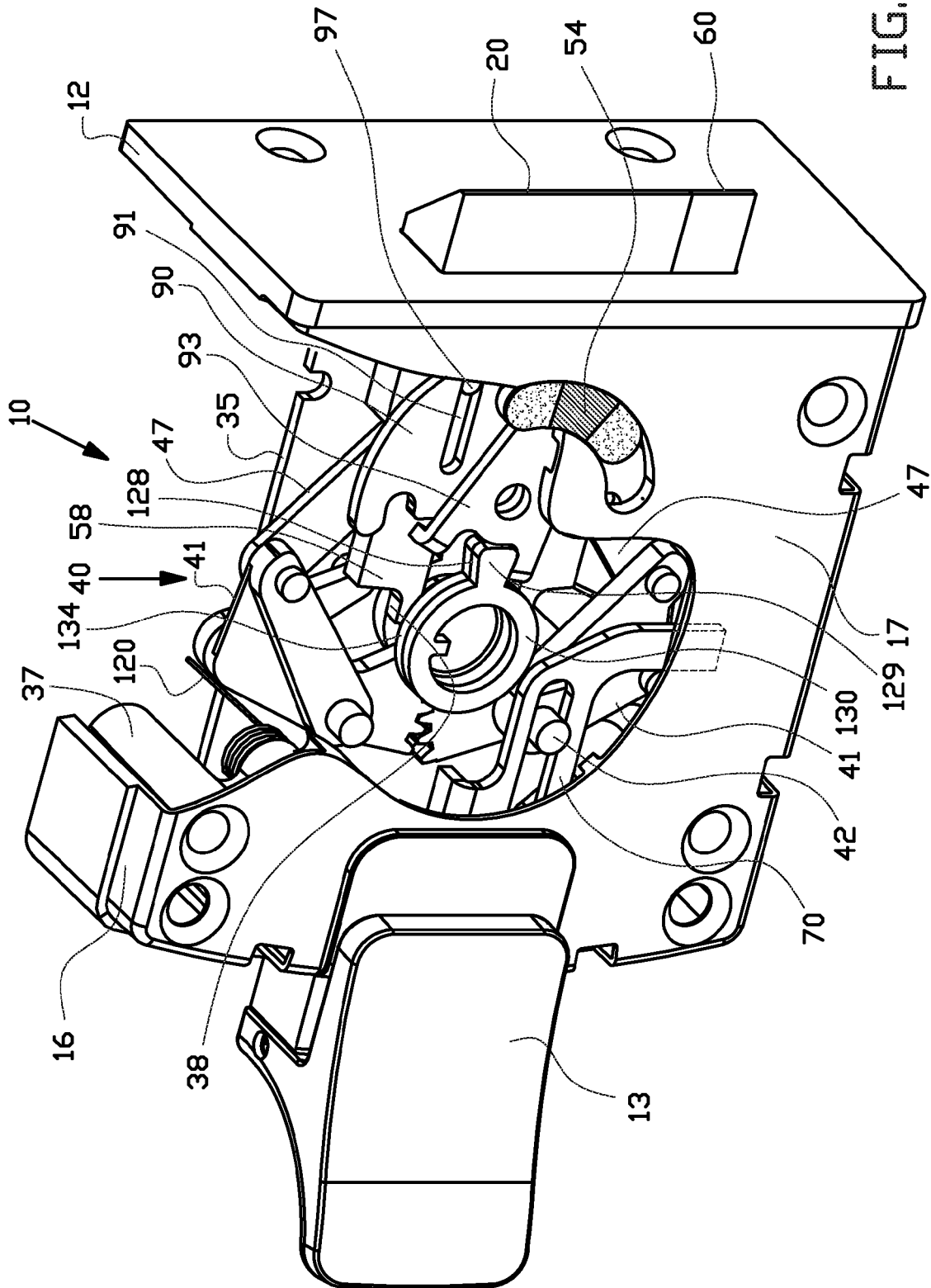
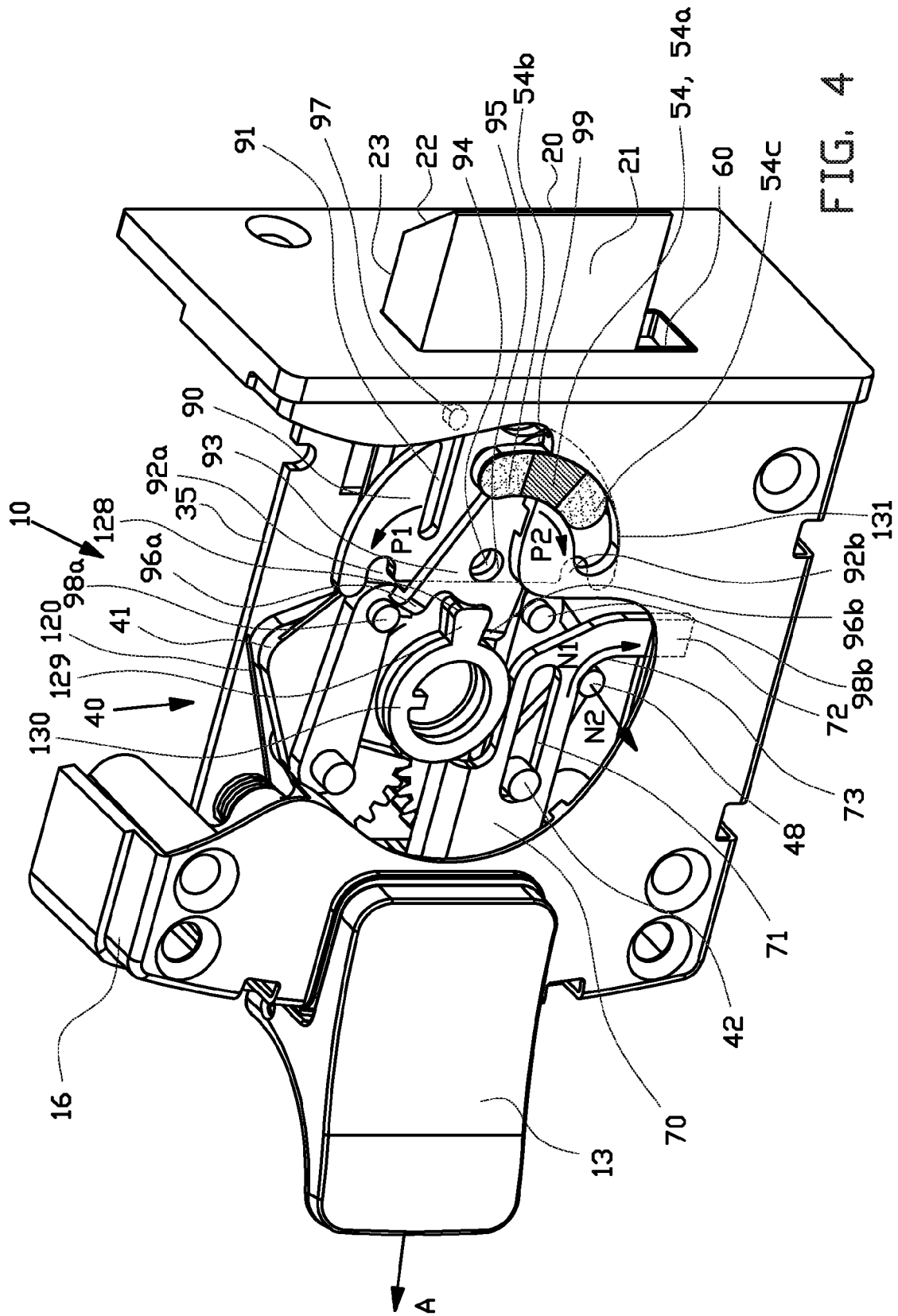
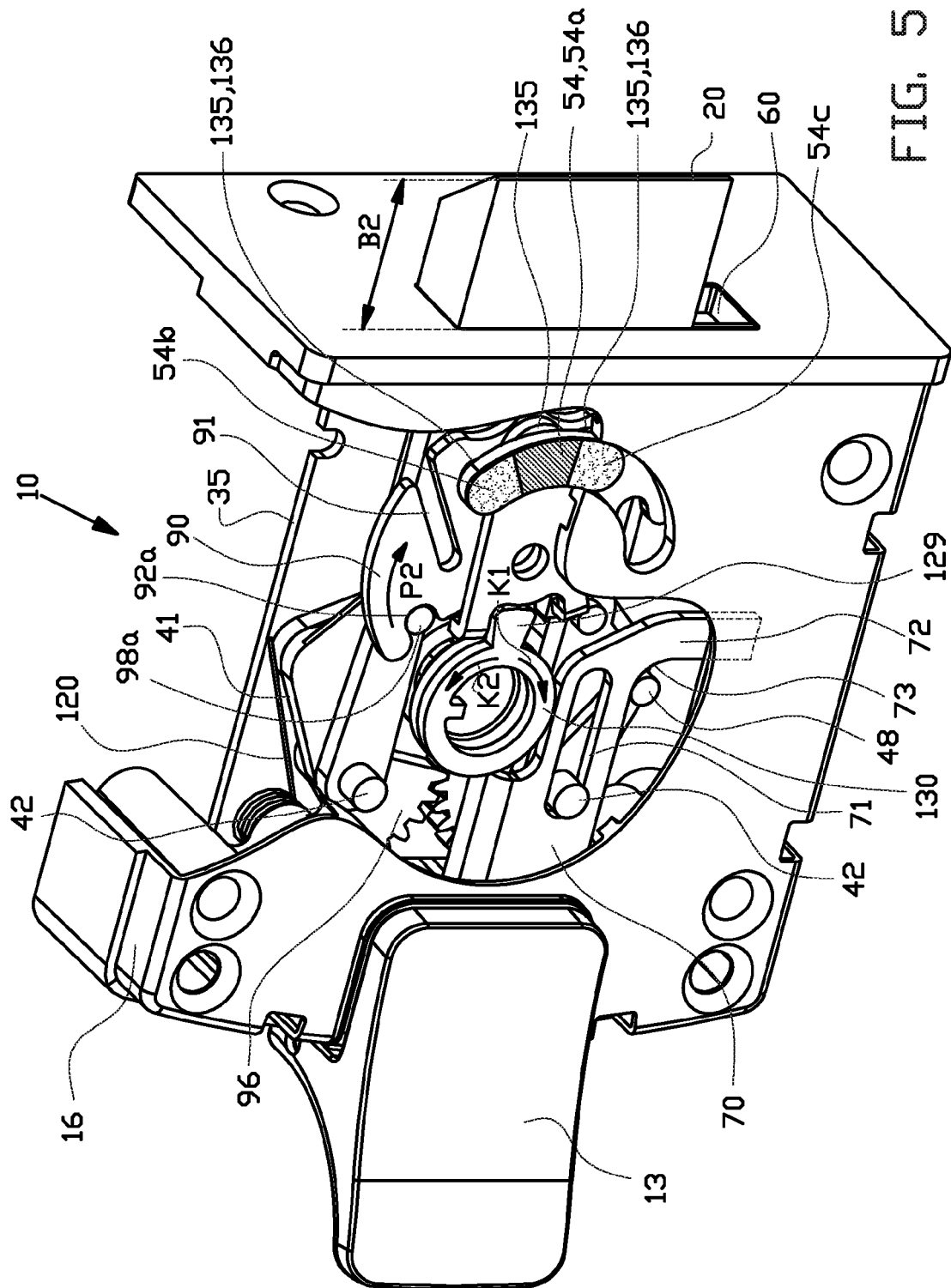


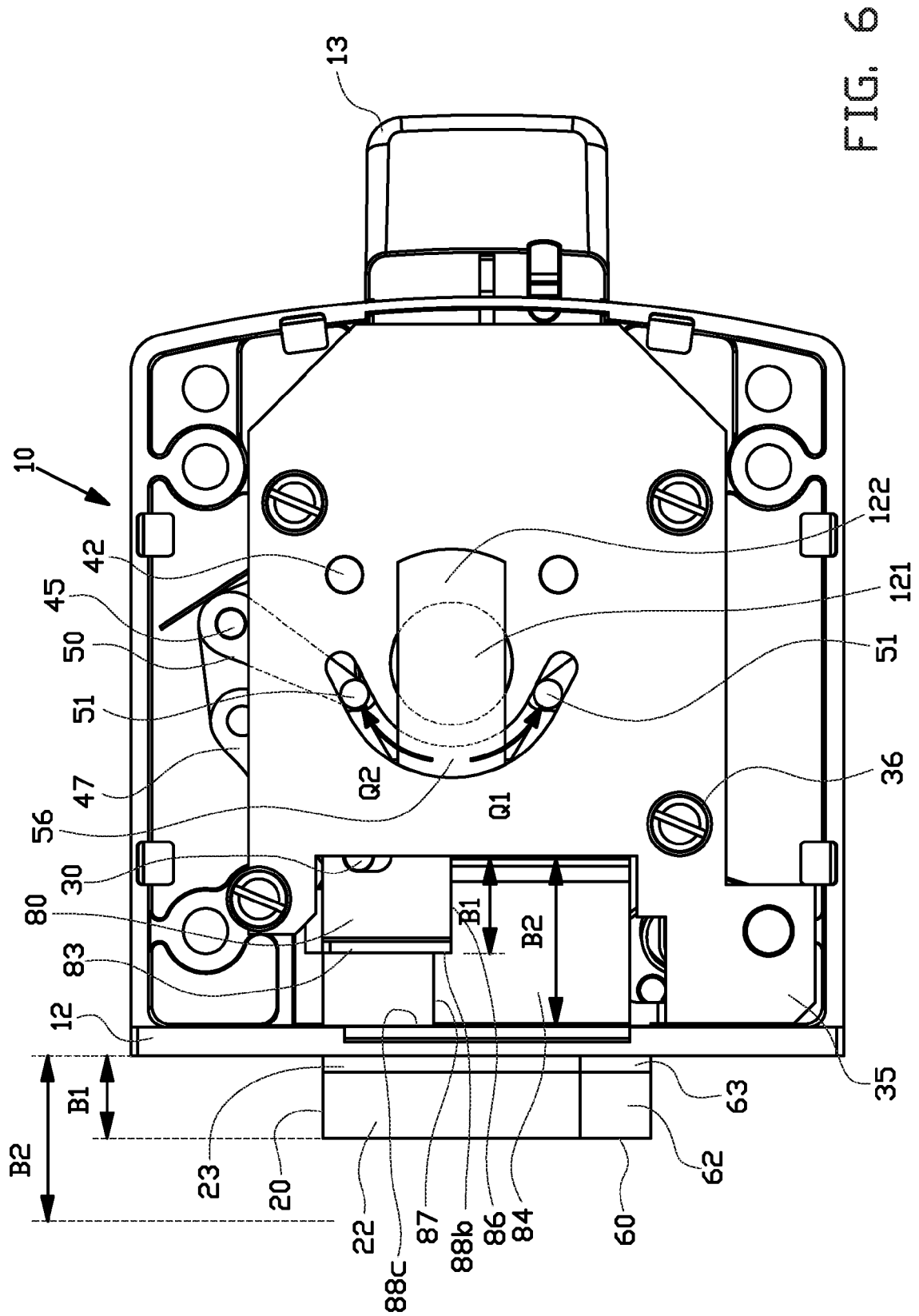
FIG. 2







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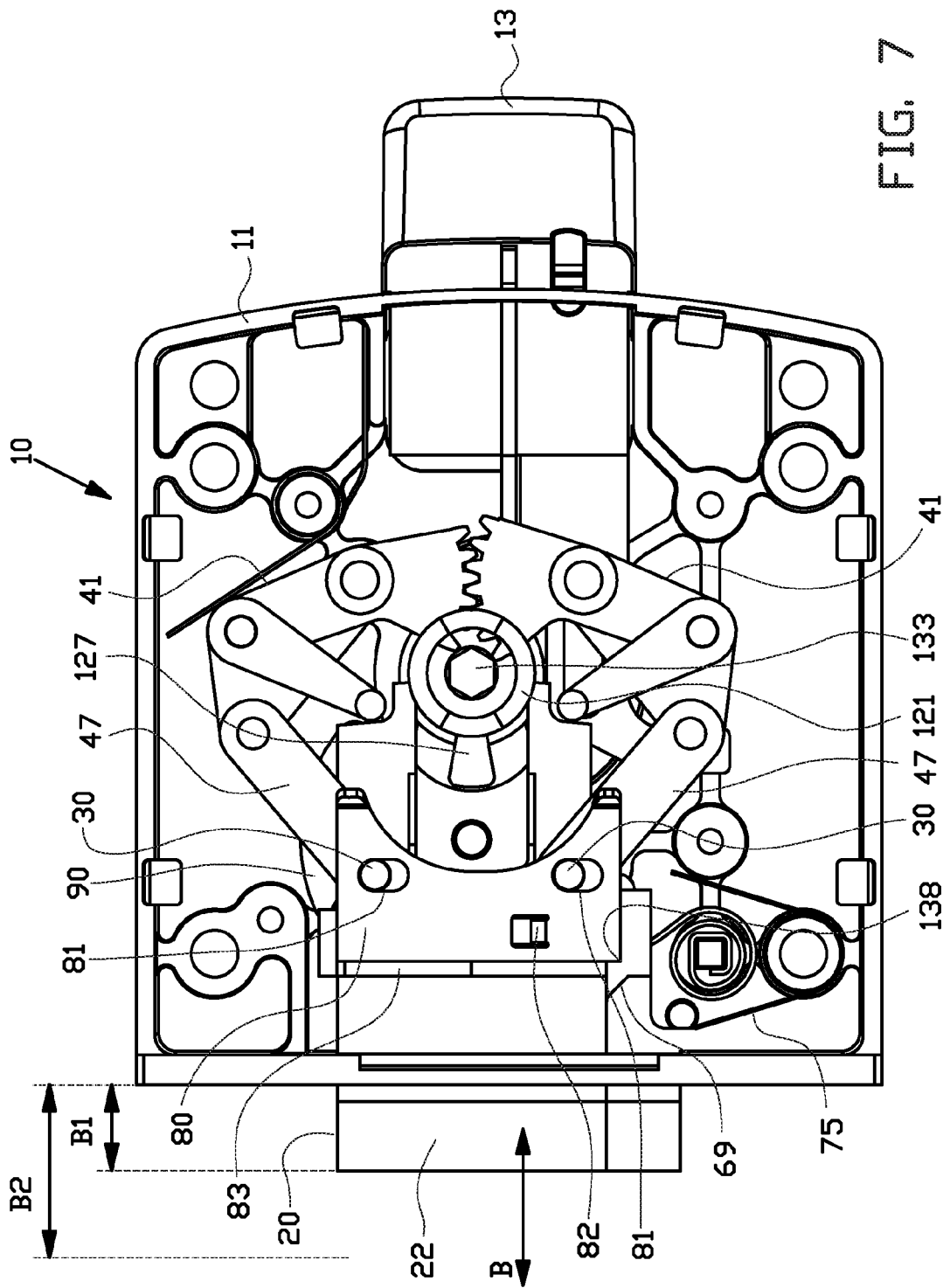
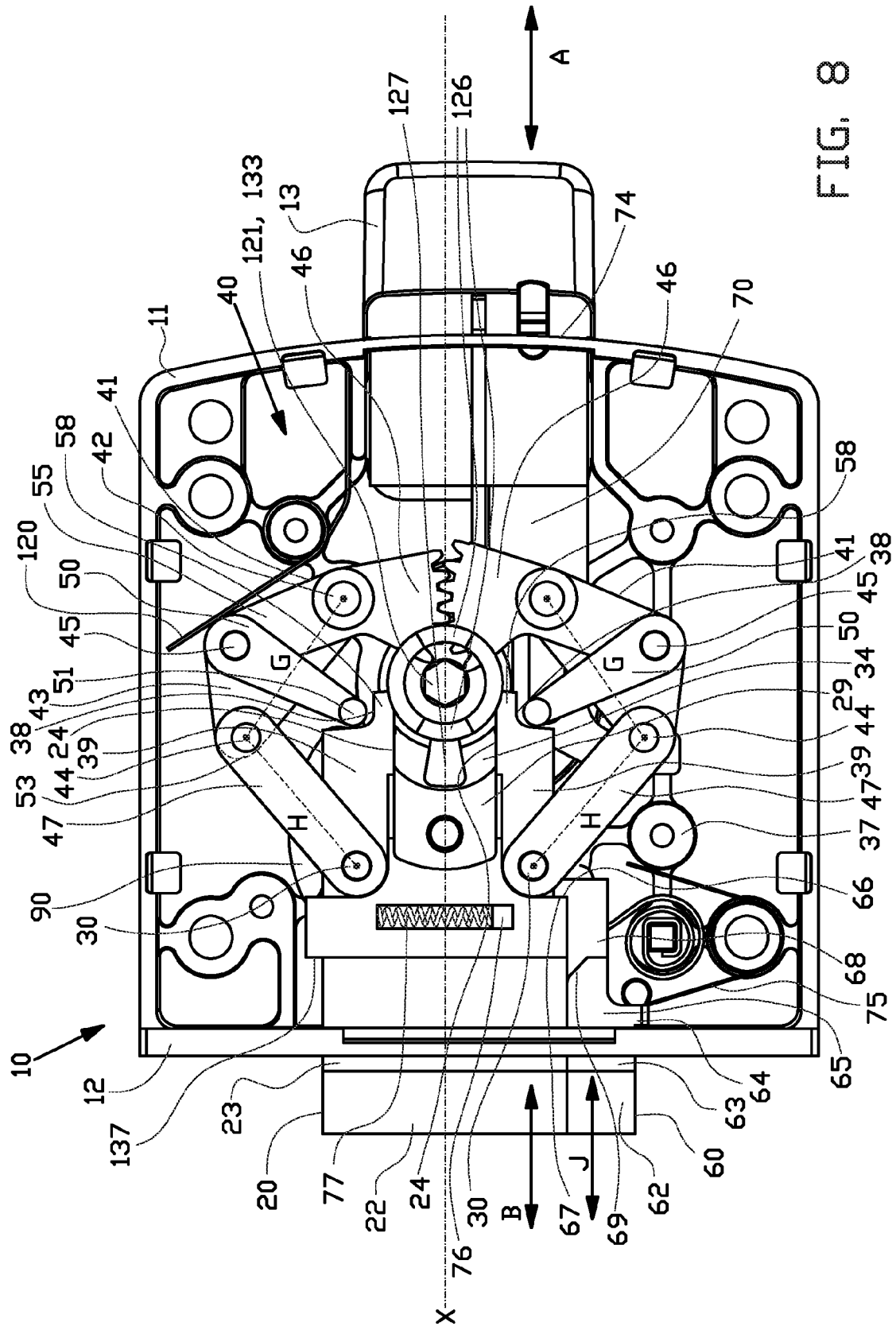


FIG. 7



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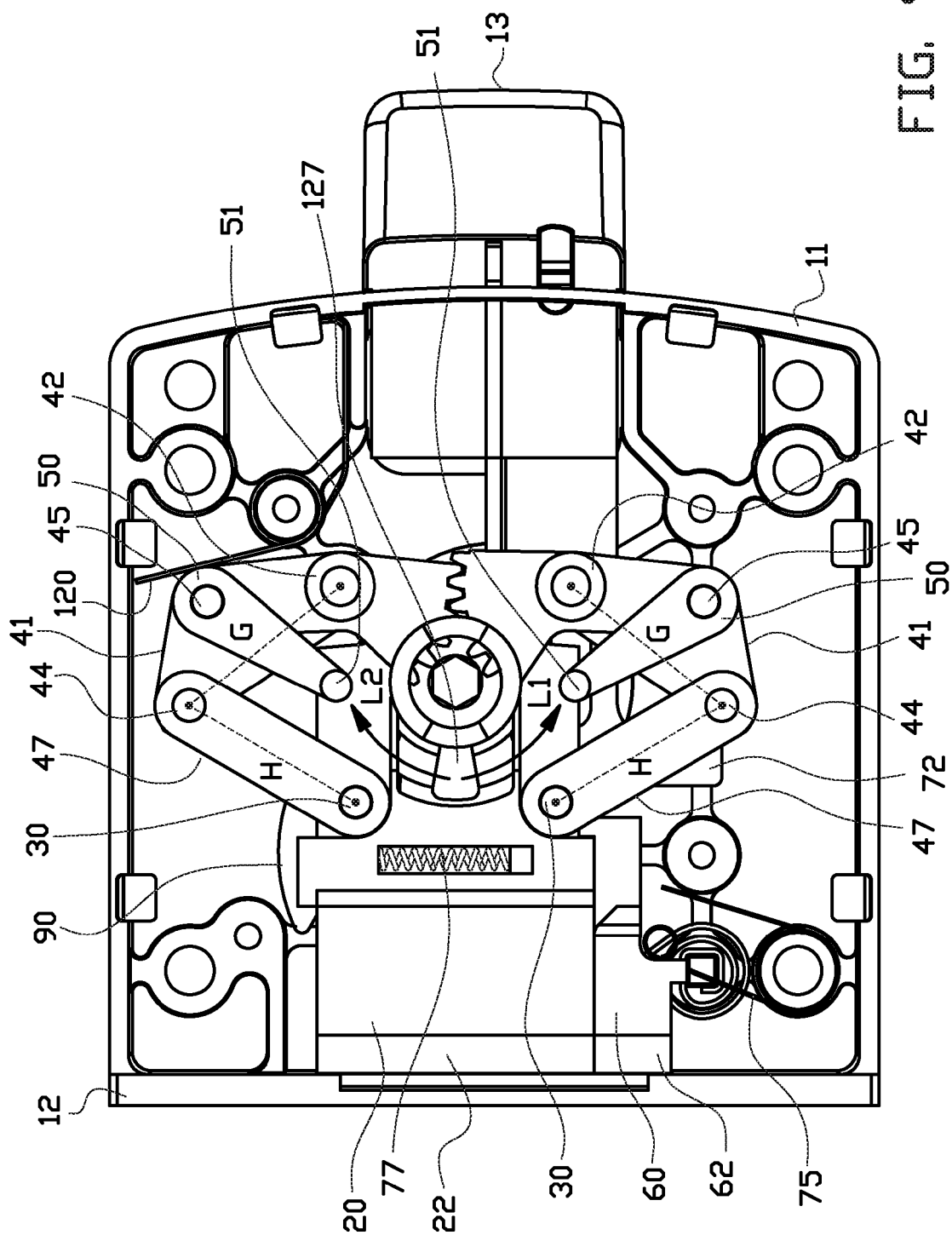
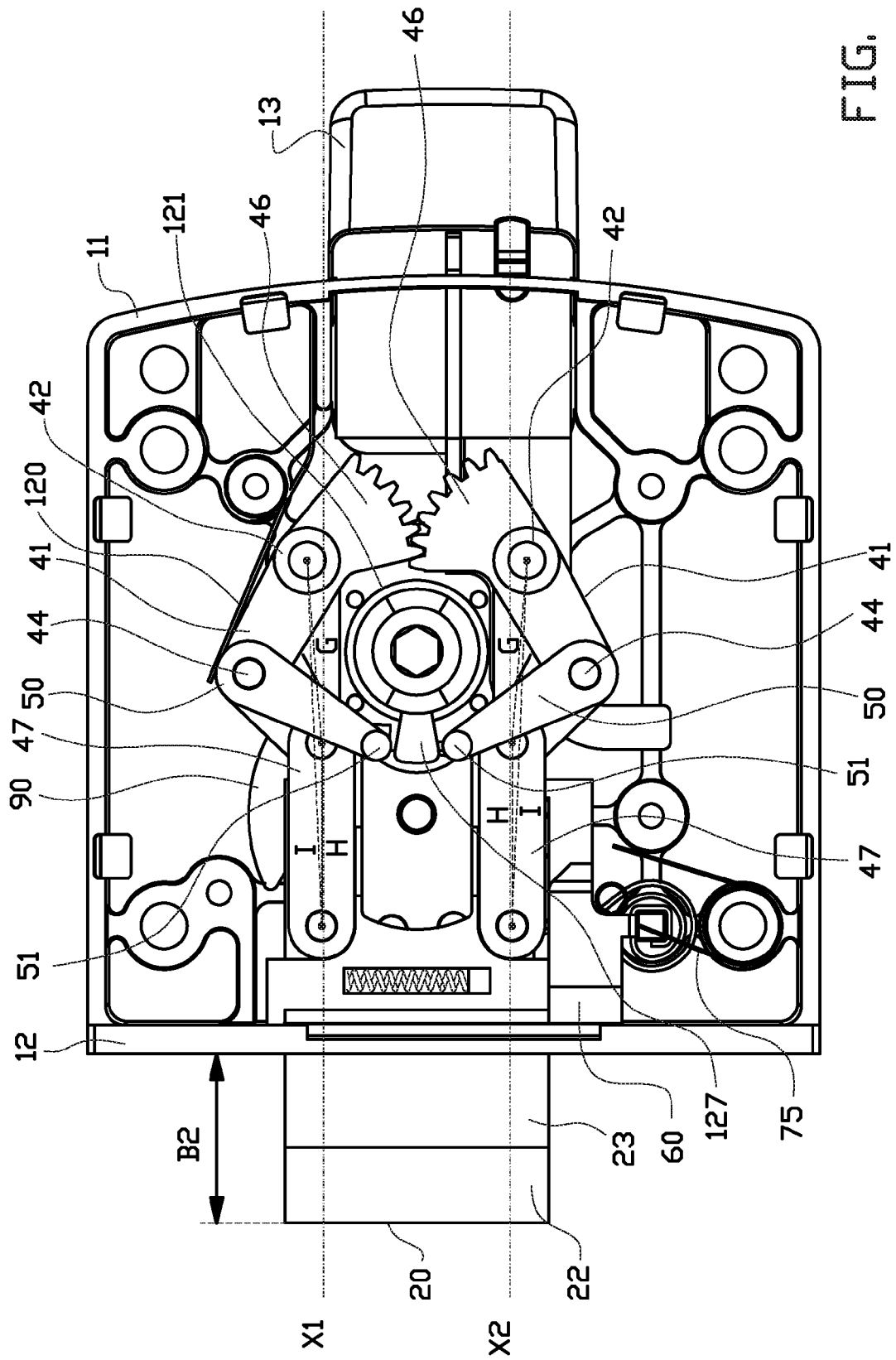
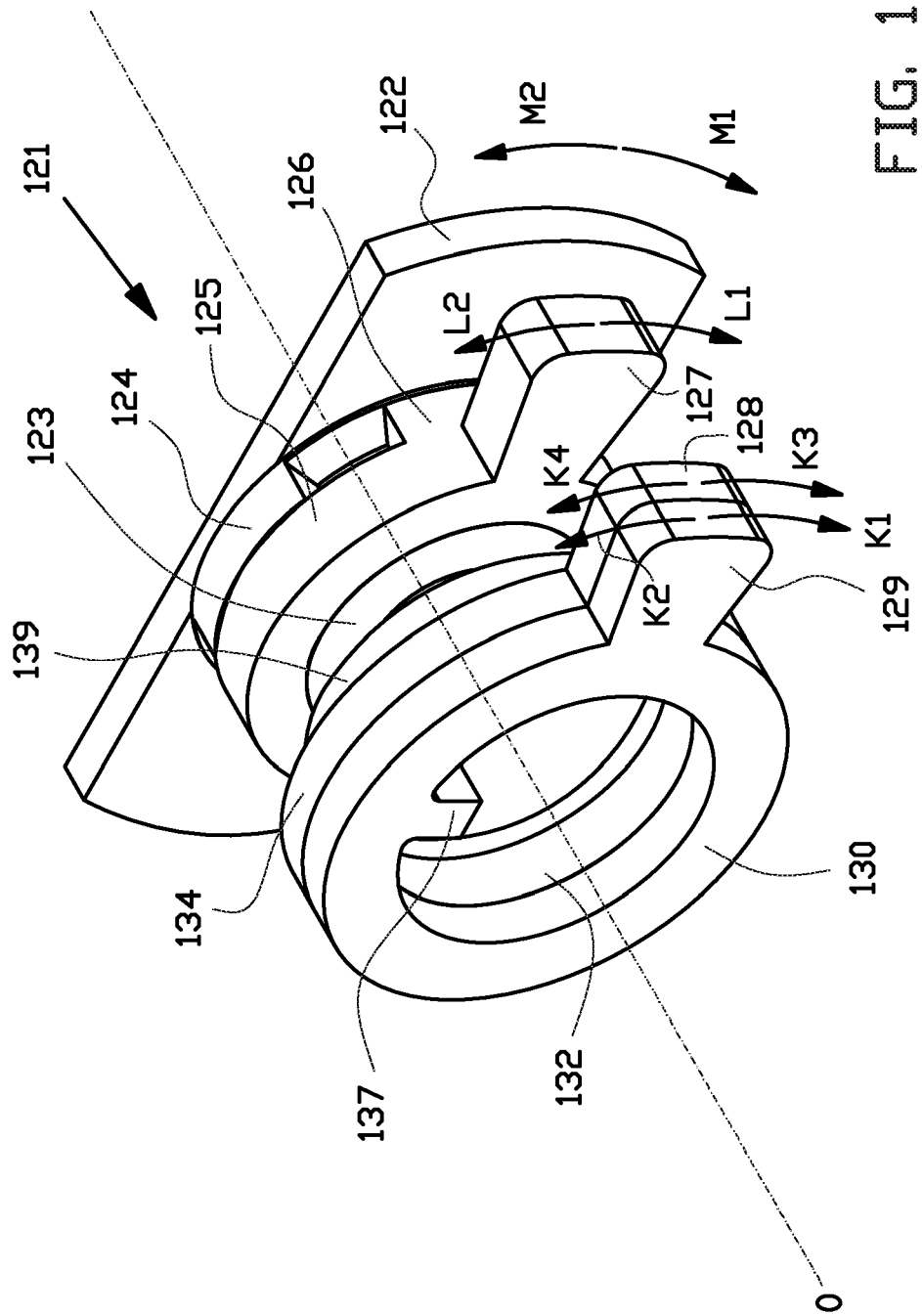


FIG. 9



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A 4x4 grid of 16 small squares, each containing a different geometric pattern of dots. The patterns are as follows:

- Row 1: A 2x2 square of dots, a horizontal line of 4 dots, a vertical line of 4 dots, and a 2x2 square of dots.
- Row 2: A 2x2 square of dots, a horizontal line of 4 dots, a vertical line of 4 dots, and a 2x2 square of dots.
- Row 3: A 2x2 square of dots, a horizontal line of 4 dots, a vertical line of 4 dots, and a 2x2 square of dots.
- Row 4: A 2x2 square of dots, a horizontal line of 4 dots, a vertical line of 4 dots, and a 2x2 square of dots.