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(71) Applicant: **Assa Abloy AB**
107 23 Stockholm (SE)

(72) Inventor: **STENLUND, Peter**
116 22 STOCKHOLM (SE)

(74) Representative: **Kransell & Wennborg KB**
P.O. Box 27834
115 93 Stockholm (SE)

(54) DOOR ASSEMBLY

(57) Door assembly (184) for locking a door (12) of a vehicle, the door assembly (184) comprising an actuator (78) having an actuator pin (74); a locking rod (10) movable between a locking position where the door (12) is locked, to an unlocking position where the door (12) is unlocked; a locking plate (38) movable between a blocking position where the locking rod (10) is blocked and an unblocking position where the locking rod (10) is unblocked; a first linkage mechanism (36) configured to transmit a movement of the actuator pin (74) to a first position to a movement of the locking plate (38) and configured to transmit a movement of the actuator pin (74) from the first position to a second position to an unlocking movement of the locking rod (10) from the locking position to the unlocking position.

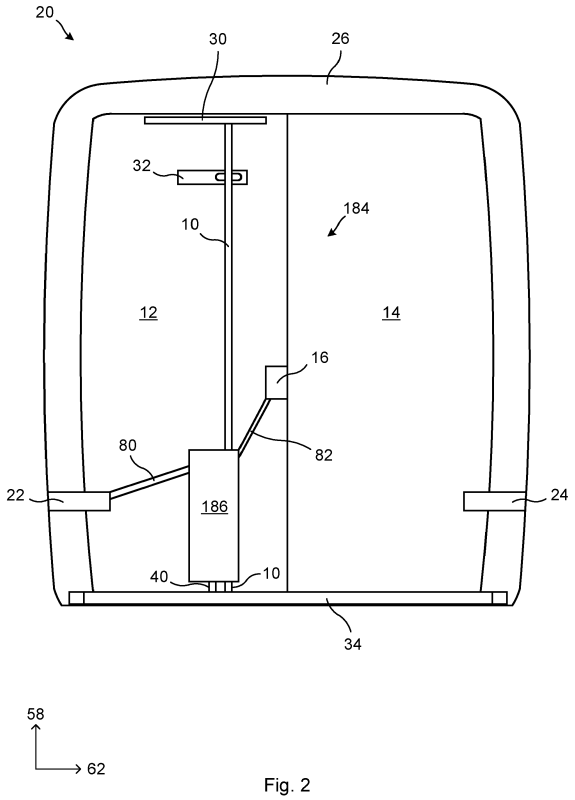

Fig. 2

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Description

TECHNICAL FIELD

[0001] The present disclosure generally relates to a door assembly. In particular, a door assembly configured to perform a blocking of a locking rod and an opening of the locking rod, are provided.

BACKGROUND

[0002] US 5755126 A discloses a retrofittable or factory installable security system for cargo loading doors. The system has a remote transmitter for transmitting a radio signal; a receiver for receiving the radio signal from the remote transmitter; an electro-mechanical actuator coupled to the receiver for moving a latching device between a locked position and an unlocked position; and the lock assembly has a housing for holding the electro-mechanical actuator, the latching device is pivotally connected to the housing, and a linkage mechanism coupling the electro-mechanical actuator and the latching device. The latching device can be moved between the locked and unlocked positions.

SUMMARY

[0003] One object of the present disclosure is to provide a safe, simple, reliable, retrofittable and/or cheap door assembly for a door.

[0004] According to one aspect, there is provided a door assembly for locking a door, the door assembly comprising an actuator having an actuator pin; a locking rod movable between a locking position where the door is locked, to an unlocking position where the door is unlocked; a locking plate movable between a blocking position where the locking rod is blocked and an unblocking position where the locking rod is unblocked; a block linkage mechanism configured to transmit a movement of the actuator pin to a first position to a movement of the locking plate and configured to transmit a movement of the actuator pin from the first position to a second position to an unlocking movement of the locking rod from the locking position to the unlocking position.

[0005] The door assembly may further comprise a locking plate comprising an aperture structure having a relatively smaller profile and a relatively larger profile, and wherein the block linkage mechanism is configured to move the locking plate from a position where the smaller profile blocks the locking rod to a position where the larger profile is aligned with the locking rod when the actuator pin moves to the first position.

[0006] The door assembly may further comprise a lock opening linkage mechanism configured to transmit a movement of the actuator pin from the second position to a third position to an unlocking movement of a lock.

[0007] The door assembly may further comprise a door opening linkage mechanism configured to transmit a movement of the actuator pin from the third position to a fourth position to an opening movement of the door.

[0008] The door assembly may be configured to be retrofitted to a vehicle.

[0009] According to a further aspect, there is provided a vehicle comprising a door assembly according to the present disclosure. One example of a vehicle for which the lock assembly is suitable is a light commercial vehicle. Light commercial vehicles, such as panel vans (vans in which the load space is enclosed), typically include a relatively large rear opening closeable by two rear doors hinged to the rear most edge of each side of the van. A latch is typically provided partially up the shut-face of one of the rear doors.

[0010] The lock assembly according to the present disclosure may be retrofitted to, or built to, any type of vehicle, such as an automobile, truck, aircraft, or ship. The lock assembly according to the present disclosure may also be used for residential doors, industrial doors and cargo container.

[0011] The lock assembly according to the present disclosure may perform at least two functions: unblock the locking plate and unlocking the locking rod (when the actuator moves to the first position and to the second position). The lock assembly may optionally comprise a third function: unlocking a lock. Alternatively, or in addition, the door assembly may further comprise a fourth function: opening a door.

[0012] The starting position, the first position, the second position, the optional third position and the optional fourth position may be sequentially arranged in the movement direction of the actuator pin. The actuator may be supported by the linkages and not necessarily rigidly attached to the door.

[0013] Generally, all terms used in the claims are to be interpreted according to their ordinary meaning in the technical field, unless explicitly defined otherwise herein. All references to "a/an/the element, apparatus, component, means, step, etc." are to be interpreted openly as referring to at least one instance of the element, apparatus, component, means, step, etc., unless explicitly stated otherwise. The steps of any method disclosed herein do not have to be performed in the exact order disclosed, unless explicitly stated.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The invention is now described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1: schematically represents a side view of a vehicle;

Fig. 2: schematically represents a rear interior view of the vehicle;

Fig. 3: schematically represents an actuator and a linkage mechanism;

Fig. 4: schematically represents a linkage mecha-

nism of a lock assembly;

Fig. 5: schematically represents a top view of a locking plate;

Fig. 6: schematically represents a side view of a locking structure;

Fig. 7: schematically represents a side view of the locking structure;

Fig. 8: schematically represents a side view of a lock opening linkage; and

Fig. 9: schematically represents a top view of a door opening linkage.

DETAILED DESCRIPTION

[0015] The invention will now be described more fully hereinafter with reference to the accompanying drawings, in which certain embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided by way of example so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout the description.

[0016] Fig. 1 schematically represents a side view of a vehicle 18. The vehicle 18 comprises a storage volume 182. The vehicle 18 is here exemplified as a van but may be any of vehicle comprising a storage volume 182. The door assembly according to the present disclosure may however be implemented in any type of doors, including container doors. The vehicle 18 comprises two doors 12, 14 at a rear section 20 of the vehicle 18. A lock 16 is arranged in the door 12 for locking the door 12. Fig. 1 further denotes a vertical direction 58 and a first horizontal direction 60.

[0017] Fig. 2 schematically represents a rear interior view from within the storage volume 182 of the vehicle 18. The vehicle 18 comprises an upper cross member 26. The vehicle 18 comprises two hinges 22, 24. The hinge 22 supports the door 12 and the hinge 24 supports the door 14.

[0018] Fig. 2 further shows a door assembly 184 according to the present disclosure. The door assembly 184 can be retrofitted to an existing vehicle 18.

[0019] The door assembly 184 of this example comprises a main body or cover 186, a locking rod or espagnolette 10, a plate member 30, a door opening linkage 80, a lock opening linkage 82, locking plate rod 40 and a bottom attachment plate 34.

[0020] An actuator (not shown) is arranged within the cover 186. The plate member 30 is attached to the upper cross member 26. A door attachment plate 32 is attached to the door 12 and supports the locking rod 10 for vertical movements. The bottom attachment plate 34 is attached to the floor of the storage volume 182. Fig. 2 further denotes a second horizontal direction 62, perpendicular to the first horizontal direction 60.

[0021] Fig. 3 schematically represents an actuator 78 and a block linkage mechanism 36 (covered by the cover 186 in Fig. 2). The actuator 78 comprises an actuator pin 74. The actuator pin 74 is linearly movable in a movement direction 76.

[0022] The block linkage mechanism 36 of this example comprises a first link member 46, a second link member 48, a third link member 50 and a fourth link member 52. The block linkage mechanism 36 further comprises a plate member 42 having a slot 44.

[0023] The first link member 46 is pivotally connected to the actuator pin 74 at a pivot 54. The first link member 46 is pivotally connected to the second link member 48 at a pivot 56. The second link member 48 is pivotally connected to a fixed pivot 84, i.e. fixed relative to the door 12. The third link member 50 is pivotally connected to the second link member 48 at a pivot 64.

[0024] The third link member 50 is pivotally connected to the second link member 48 at a pivot 64. The third link member 50 comprises a slot 188. The fourth link member 52 comprises a pivot pin 68 guided in the slot 188 of the third link member 50.

[0025] The locking plate rod 40 is pivotally connected to the fourth link member 52 by a pivot pin 66. The pivot pin 66 is guided in the slot 44. The locking rod 10 is pivotally connected to the fourth link member 52 at pivot 190.

[0026] By moving the actuator pin 74 from the illustrated starting position in Fig. 3 to a first position, the first link member 46 pulls the second link member 48 to rotate in the clockwise direction. The second plate member 48 thereby pushes the third link member 50 and the pin 68 travels in the slot 68. The movement of the third link member 50 causes a slight movement of the fourth link member 52. The movement of the fourth link member 52 causes a small movement 72 upwards of the locking plate rod 40.

[0027] By moving the actuator pin 74 further from the first position to a second position, the pin 68 reaches the end of the slot 188. The fourth member 52 is then rotated further about the pivot 84 such that the locking rod 10 is moved upwards in direction 70.

[0028] Fig. 4 schematically represents a linkage mechanism 192 of the door assembly 184. The linkage mechanism 192 of this example is configured to transmit a movement of the locking plate rod 40 to a movement of a locking plate 38.

[0029] When the actuator pin 74 is moved from from the starting position to the first position, the locking plate rod 40 is moved upwards in direction 72. The locking plate rod 40 is pivotally mounted to a rotatable member 86. The rotatable member 86 is rotatable about a pivot 88. The movement of the locking plate rod 40 causes the rotatable member 86 to rotate in rotational direction 92. The rotation of the rotatable member 86 pushes a link member 94 via pivot 90. The movement of the link member 94 pushes a locking plate 38 via a pivot 102 to move in direction 96. The locking plate is arranged under the bottom attachment plate.

[0030] The locking rod 10 comprises a waist 100 and a locking pin 98. At the waist 100, the locking rod 10 may for example have a diameter of 12 mm. The waist 100 resists breaking of the locking rod 10 by shear forces.

[0031] In the illustrated position in Fig. 4, the locking plate 38 engages the waist 100 such that the locking rod 10 is blocked. When the actuator pin 74 moves from the starting position to a first position, the locking rod 10 is locked by the locking plate 38.

[0032] Fig. 5 schematically illustrates a top view of the locking plate 38. The locking plate 38 comprises an aperture structure having a larger through hole 106 joined to a smaller through hole 104. In Fig. 4, the smaller through hole 104 is engaged. When the actuator pin 74 has moved to the first position, the larger through hole 106 is aligned with the locking rod 10.

[0033] Figs. 6 and 7 schematically represent side views of a locking structure 108. The locking structure 108 is attached to the plate member 30. In Fig. 6, an upper locking pin 112 of the locking rod 10 is blocked by a lip of the locking structure 108. When the actuator pin 74 moves from the first position to the second position, the locking rod 10 moves from the position in Fig. 6 to the position in Fig. 7. If the locking rod 10 is forcibly moved by a thief, there is a chance that the locking rod 10 is moved too far up such that the locking pin 112 is blocked by a recess 110 of the locking structure 108. However, when the actuator pin 74 is in the second position, the locking pin 112 is aligned with the opening of the locking structure 108 as shown in Fig. 7.

[0034] Fig. 8 schematically represents a side view of the lock opening linkage 82 of the door assembly 184. The actuator pin 74 is in the second position in Fig. 8. The lock opening linkage 82 comprises a fifth link member 114, a rocker arm 120, a sixth link member 132 and a seventh link member 138. The fifth link member 114 is pivotally coupled to the rocker arm 120 at a pivot 124. The rocker arm 120 is pivotally coupled to the sixth link member 132 at a pivot 126. The rocker arm 120 pivots about a pivot 122. The sixth link member 132 is coupled to the seventh arm 138 at a pivot 128. The seventh link member 138 is pivotally coupled to the door 12 at pivot 130. The seventh link member 138 is pivotally coupled to a latch 144 of the lock 16. The latch 144 is pivotally coupled to the lock case 16.

[0035] A slot 148 is provided in the actuator pin 74. A pin 116 of the fifth link member 114 is engaged in the slot 148. As can be seen in Fig. 8, when the actuator pin 74 has moved to the second position, the pin 116 has reached the end of the slot 148.

[0036] When the actuator pin 74 moves from the illustrated second position to a third position, the fifth link member 114 moves in the movement direction 74, the rocker arm 120 rotates in rotational direction 118, the sixth link member 132 moves in the movement direction 134, the seventh link member 138 rotates in rotational direction 136 about pivot 130 and the latch 144 is rotated in the rotational direction 140 from the illustrated closed position to an open position. In this manner, the lock 16 is unlocked.

[0037] Fig. 9 schematically represents a top view of the door opening linkage 80. The door opening linkage 80 comprises an eighth link member 154, a ninth link member 156 and a tenth link member 166. As can be seen in Fig. 9, the hinge 22 comprises an eleventh link member 168 and a twelfth link member 174. The eleventh link member 168 is pivotally coupled to the chassi 178 of the vehicle 18 at a pivot 180.

[0038] By moving the actuator pin 74 from the third position illustrated in Fig. 9 to a fourth position, the eighth link member 154 is moved in movement direction 74. The eighth link member 154 is pivotally coupled to the ninth link member 156 at pivot 162 and pushes the ninth link member 156 to pivot about a pivot 158 fixed relative to the door 12 in rotational direction 160. The ninth link member 156 is pivotally coupled to the tenth link member 166 at pivot 164. When the ninth link member 156 is rotated in rotational direction 160, the tenth link member 166 moves and pushes the eleventh link member 168 via pivot 170. The eleventh link member 168 is thereby rotated (counterclockwise) in Fig. 9 to push the twelfth link member 174. The twelfth link member 174 is connected to the eleventh link member 168 at pivot y2. The twelfth link member 174 is also connected to a pivot 176 fixedly attached to the door 12. Thus, when the twelfth link member 174 is pushed by the eleventh link member 168, the door 12 opens.

[0039] An emergency opening device may be provided on the inside of the door 12 to prevent a person to get stuck in the storage volume 182. A biometric validation may be made before the operator can command the opening sequence of the actuator 78.

[0040] While the present disclosure has been described with reference to exemplary embodiments, it will be appreciated that the present invention is not limited to what has been described above. For example, it will be appreciated that the dimensions of the parts may be varied as needed. Accordingly, it is intended that the present invention may be limited only by the scope of the claims appended hereto.

Claims

1. Door assembly (184) for locking a door (12), the door assembly (184) comprising:

   - an actuator (78) having an actuator pin (74);
   - a locking rod (10) movable between a locking position where the door (12) is locked, to an unlocking position where the door (12) is unlocked;
   - a locking plate (38) movable between a blocking position where the locking rod (10) is blocked and an unblocking position where the locking rod (10) is unblocked;
   - a block linkage mechanism (36) configured to

transmit a movement of the actuator pin (74) to a first position to a movement of the locking plate (38) and configured to transmit a movement of the actuator pin (74) from the first position to a second position to an unlocking movement of the locking rod (10) from the locking position to the unlocking position.

2. The door assembly (184) according to claim 1, further comprising a locking plate (38) comprising an aperture structure having a relatively smaller profile (104) and a relatively larger profile (106), and wherein the block linkage mechanism (36) is configured to move the locking plate (38) from a position where the smaller profile (104) blocks the locking rod (10) to a position where the larger profile (106) is aligned with the locking rod (10) when the actuator pin (74) moves to the first position.

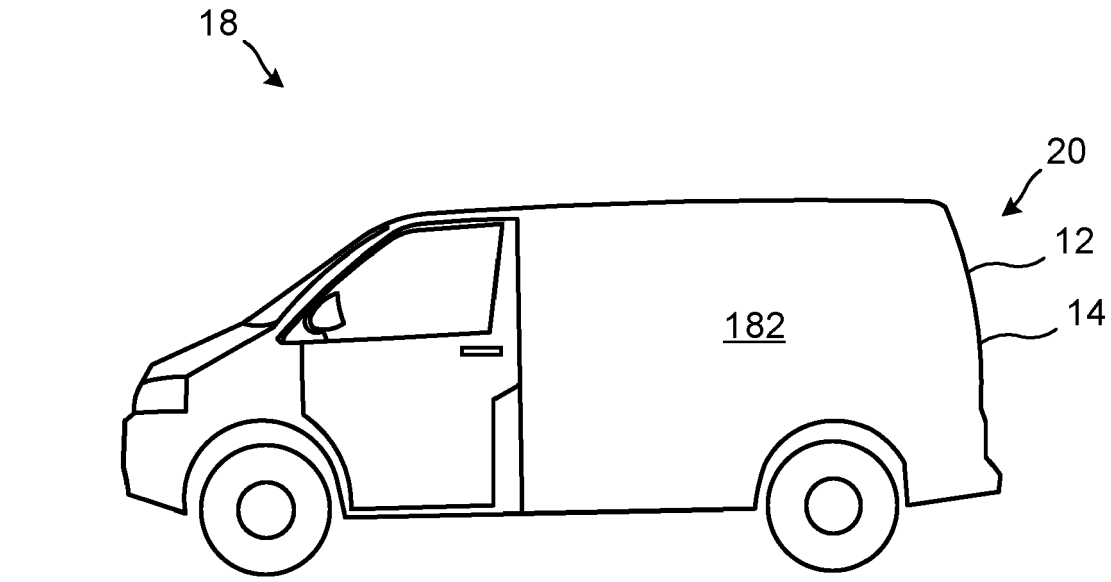
3. The door assembly (184) according to claim 1 or 2, further comprising a lock opening linkage mechanism (82) configured to transmit a movement of the actuator pin (74) from the second position to a third position to an unlocking movement of a lock (16).

4. The door assembly (184) according to claim 1 or 2, further comprising a door opening linkage mechanism (80) configured to transmit a movement of the actuator pin (74) from the third position to a fourth position to an opening movement of the door (12).

5. The door assembly (184) according to any of the preceding claims, wherein the door assembly (184) is configured to be retrofitted to a vehicle (18).

6. Vehicle (18) comprising a door assembly (184) according to any of the preceding claims.

7. The vehicle (18) according to claim 6, wherein the vehicle (18) is a van.



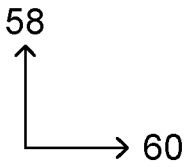


Fig. 1

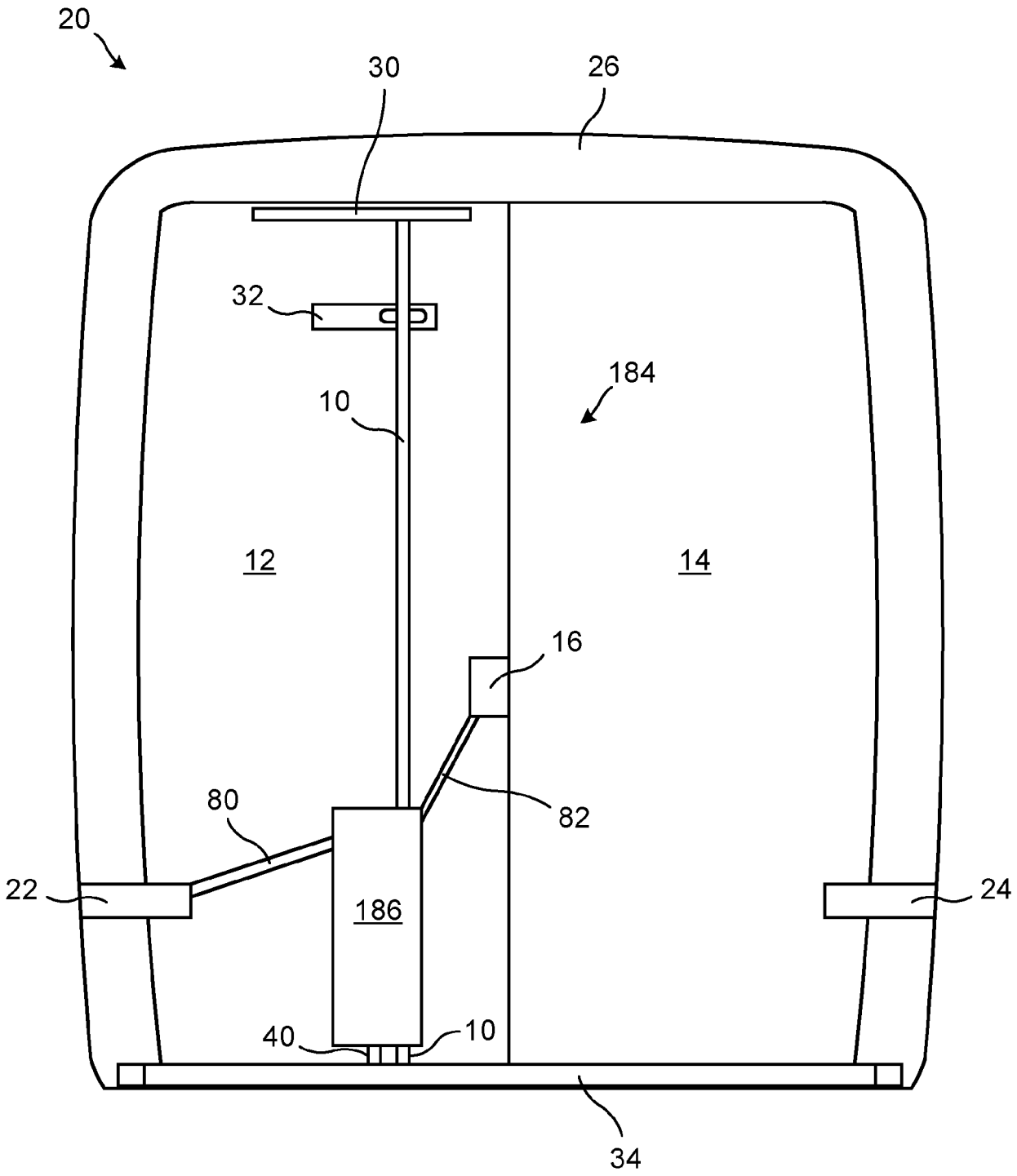
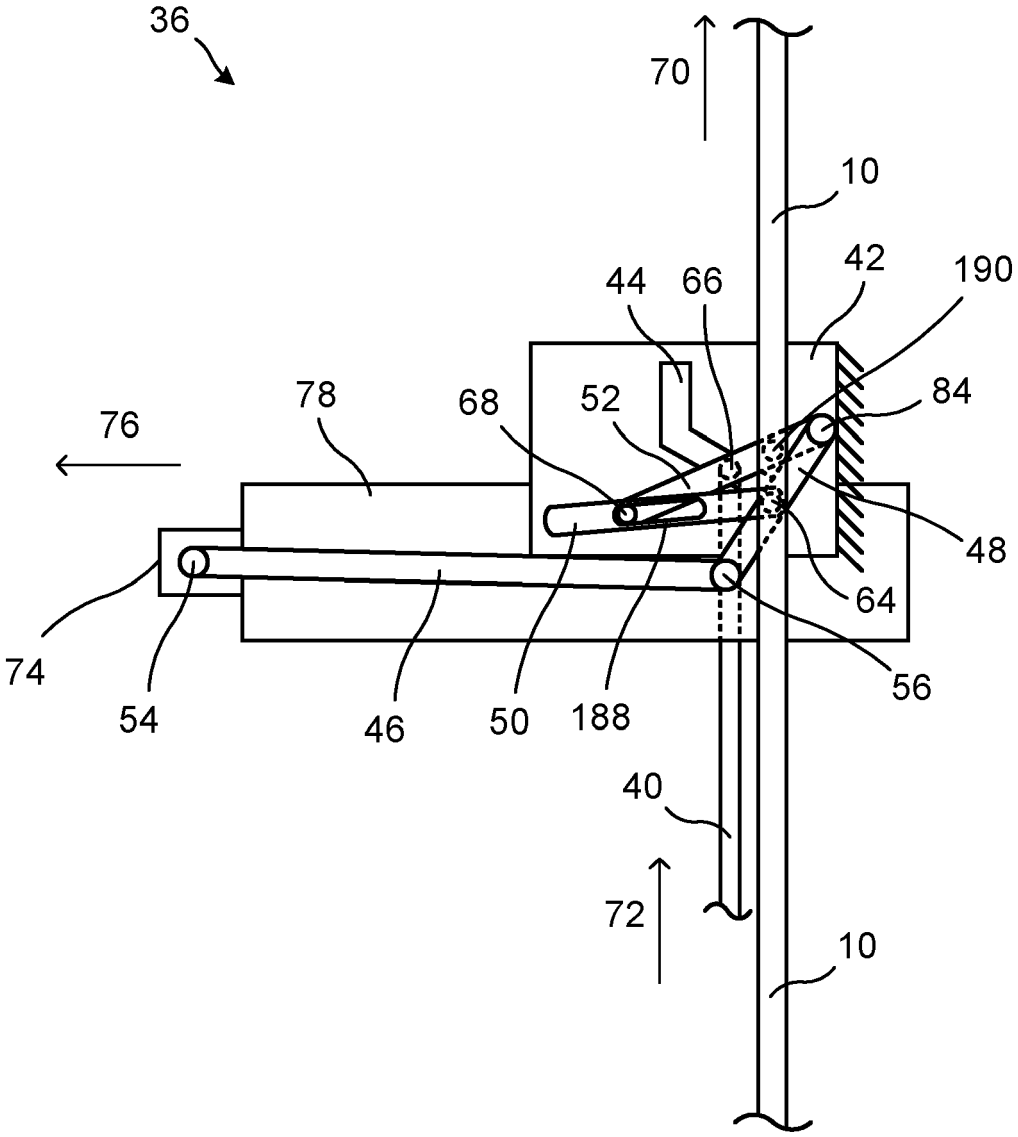


Fig. 2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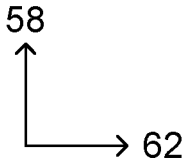
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Fig. 3

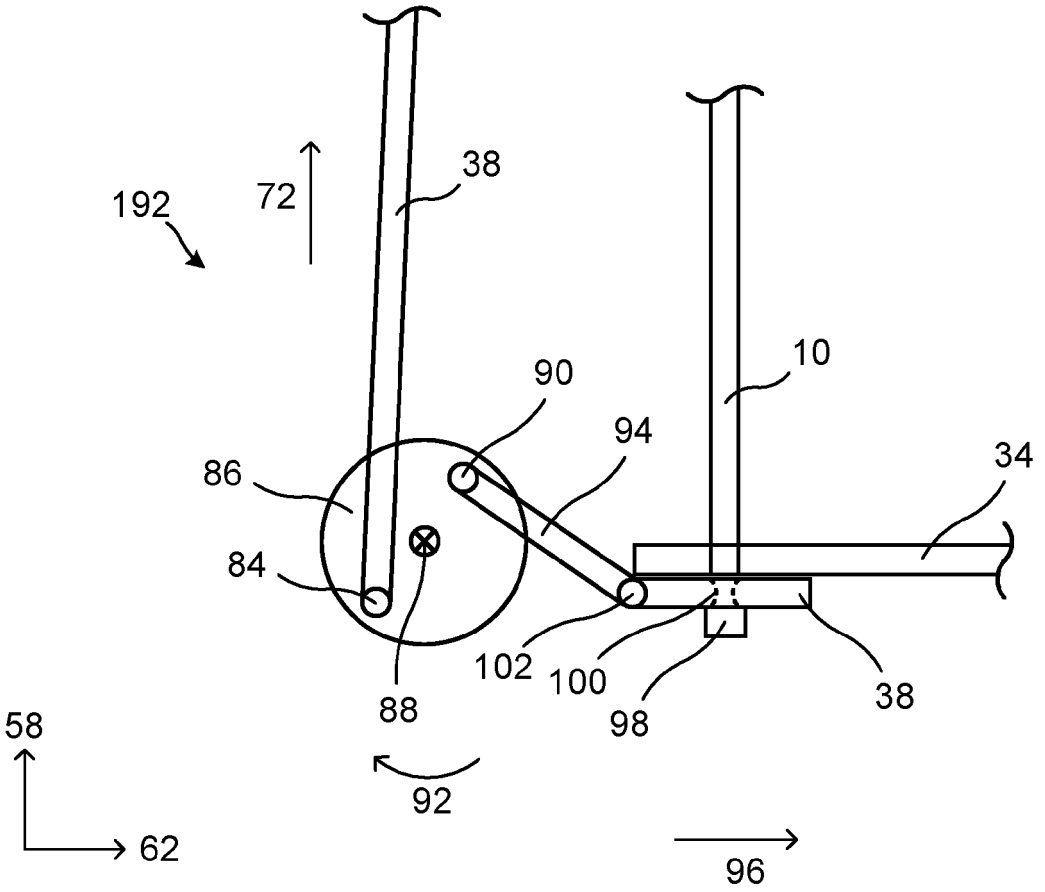
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Fig. 4

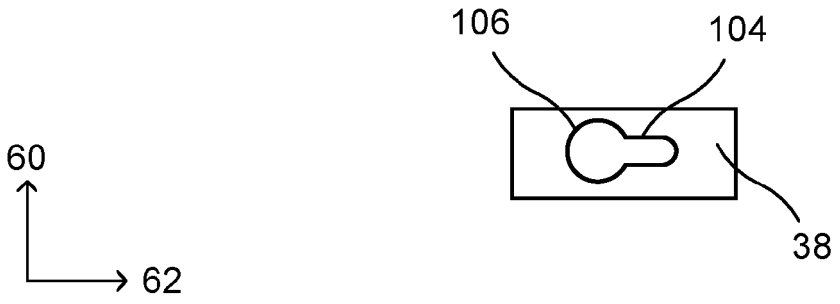
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Fig. 5

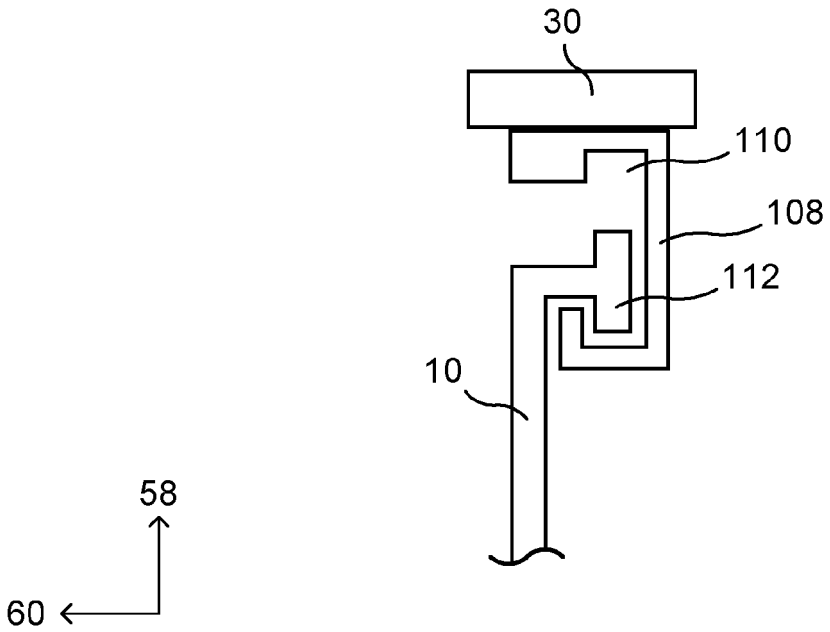


Fig. 6

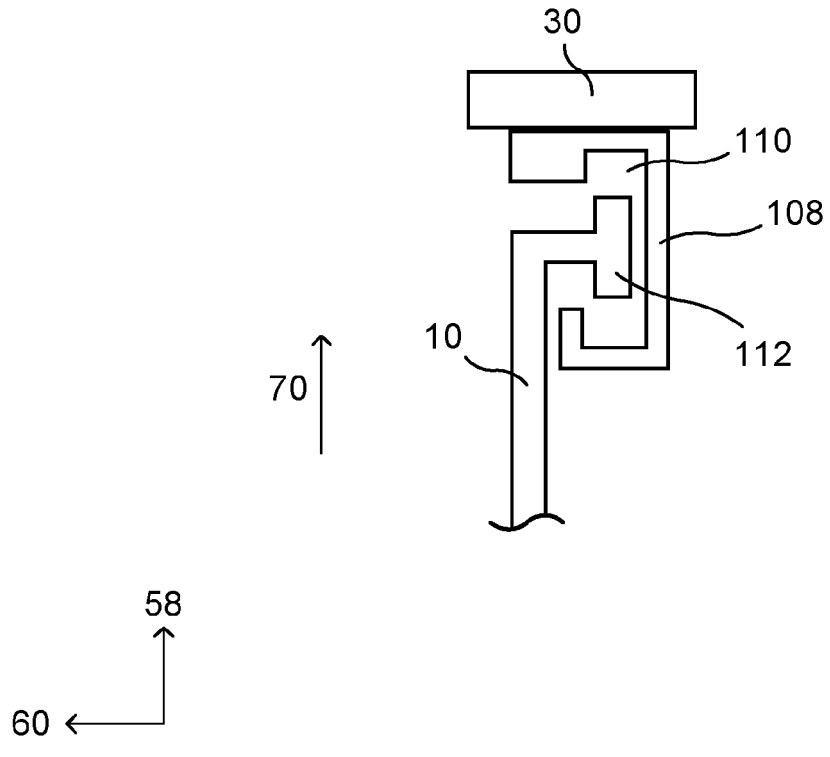
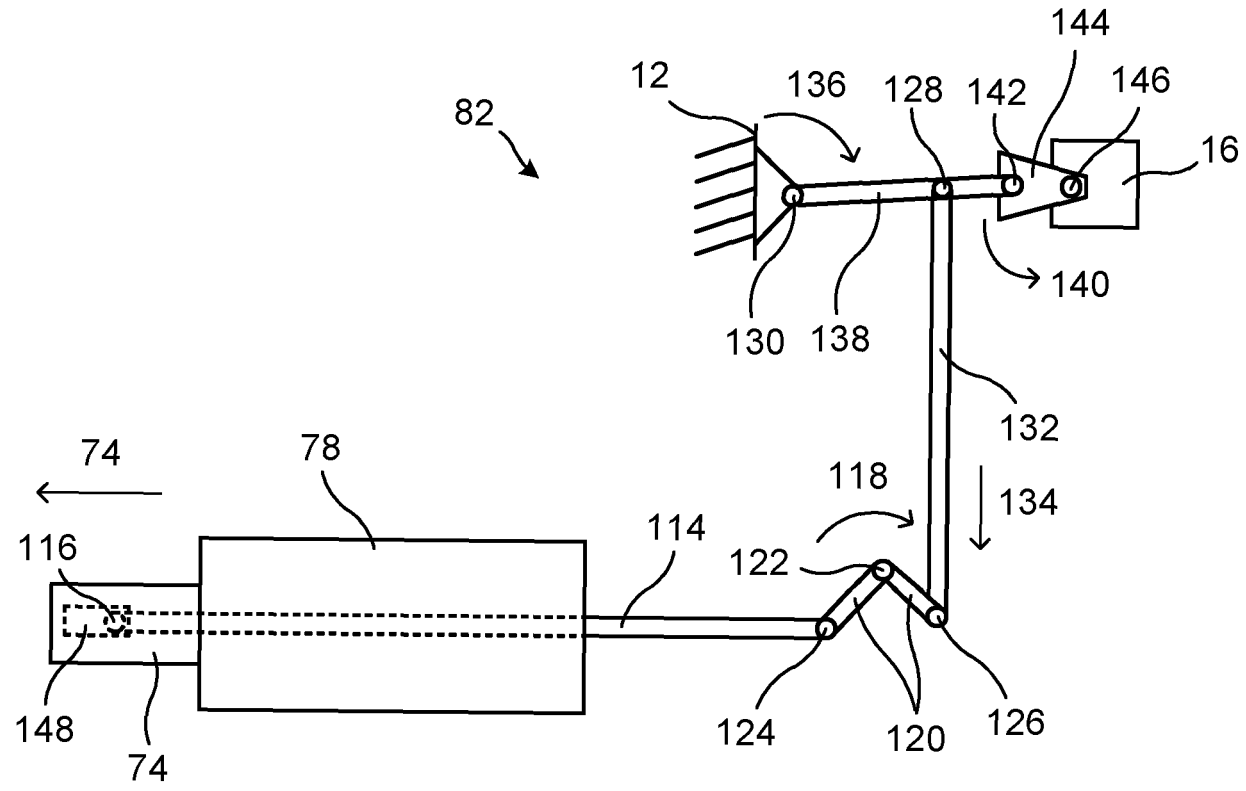


Fig. 7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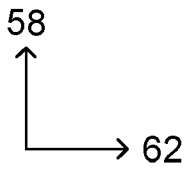
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Fig. 8

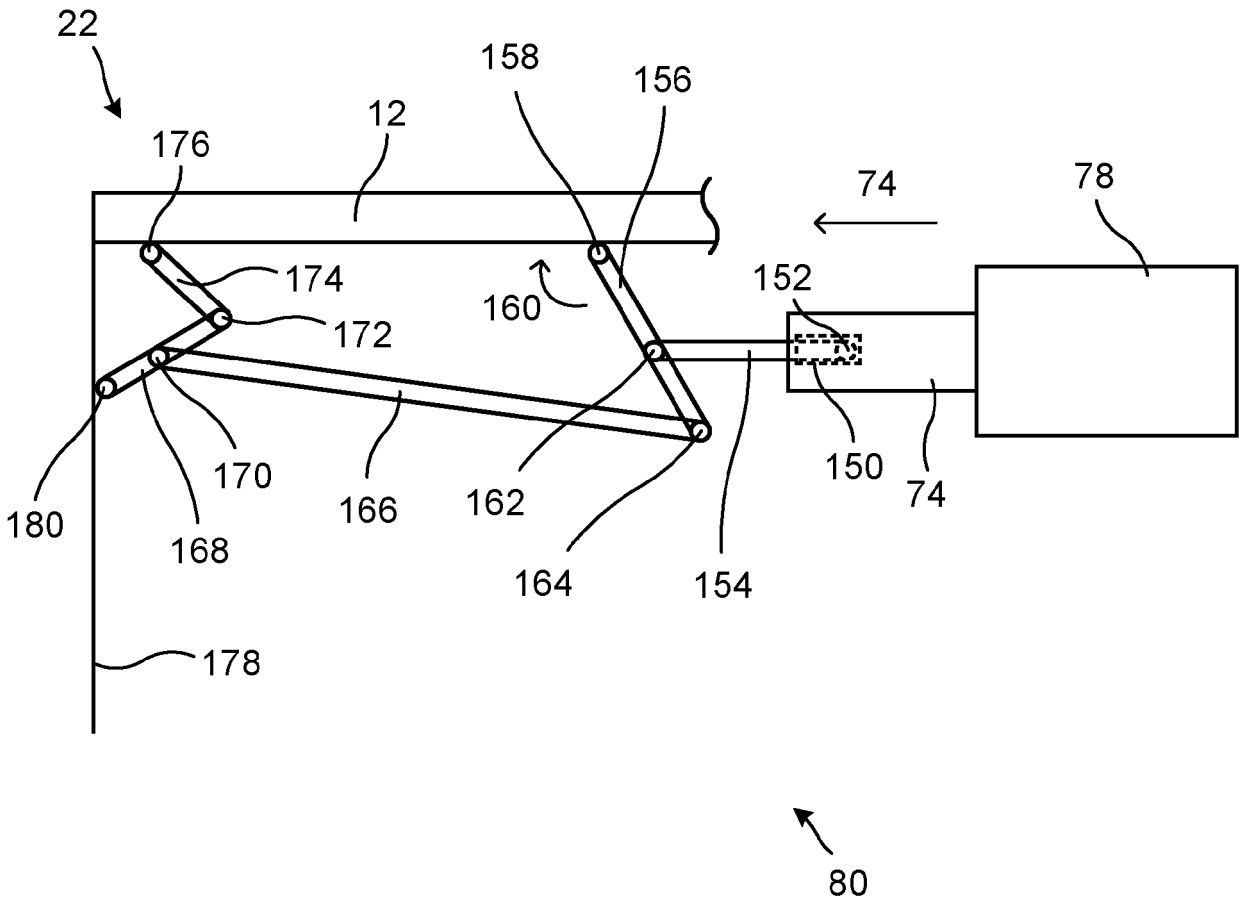
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Fig. 9

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EUROPEAN SEARCH REPORT

Application Number
EP 17 19 8139

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E05B
E05C
E05F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	23 April 2018	Koster, Michael

CATEGORY OF CITED DOCUMENTS

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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