(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
04 January 2024 (04.01.2024)

WIPO | PCT

(10) International Publication Number
WO 2024/000126 A1

(51) International Patent Classification:
F16H 61/22 (2006.01) *F16H 59/10* (2006.01)

(21) International Application Number:
PCT/CN2022/101673

(22) International Filing Date:
27 June 2022 (27.06.2022)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant: **GHSP, INC.** [US/US]; 701 S. Waverly Road, Holland, Michigan 49423 (US).

(72) Inventor; and
(71) Applicant *(for MG only)*: **PAN, Mingkun** [CN/CN]; No. 71, Xing Ting Rd, Jiading, Shanghai 201814 (CN).

(72) Inventors: **CHEN, Yichen**; No. 71, Xing Ting Rd, Jiading, Shanghai 201814 (CN). **YAO, Xin**; No. 71, Xing Ting Rd, Jiading, Shanghai 201814 (CN).

(74) Agent: **IP MARCH**; 1508 Satellite Building, 63 Zhichun Road, Haidian District, Beijing 100190 (CN).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report (Art. 21(3))*

(54) **Title:** SELECTION ASSEMBLY FOR A VEHICLE THAT INCLUDES A PARK BLOCKER AND NEUTRAL BLOCKER THAT ARE OPERATED BY A SINGLE ACTUATOR

(57) **Abstract:** A selection assembly for a vehicle includes a lever that is operable between at least a park position and a neutral position. A solenoid is operable between a first position and a second position. A selector lock is operated by the solenoid to selectively lock the lever when the lever is in the park position and when the lever is in the neutral position. A controller is in communication with the lever, the solenoid and a brake pedal, wherein the controller operates the solenoid in response to predetermined operational movements of the lever and the brake pedal.

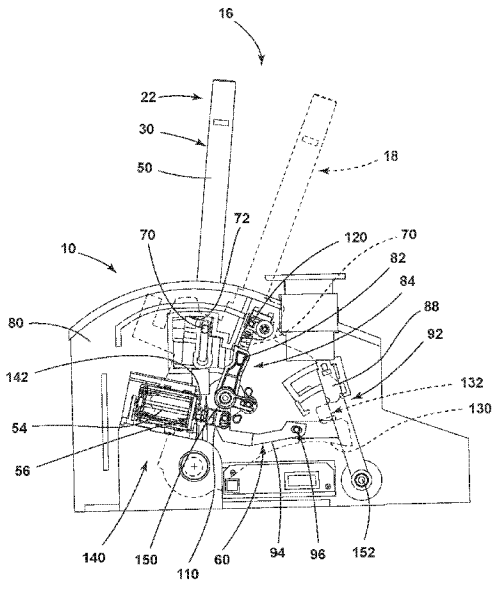

FIG. 4

WO 2024/000126 A1

SELECTION ASSEMBLY FOR A VEHICLE THAT INCLUDES A PARK BLOCKER AND NEUTRAL BLOCKER THAT ARE OPERATED BY A SINGLE ACTUATOR

FIELD OF THE INVENTION

[0001] The present invention generally relates to selection assemblies for vehicles, and more specifically, a selection assembly that includes a mechanism for blocking a lever in a park position and a separate blocker for locking the lever in a neutral position, where each of these blockers are operated by a single and common actuator.

BACKGROUND OF THE INVENTION

[0002] Within various vehicles, gear selection assemblies include various securing features for temporarily maintaining a selector interface within or out of a particular gear position, such as park or neutral. These securing mechanisms are meant to prevent inadvertent or unintentional operation of the gear selection assembly away from or into particular gear positions. These securing features can be useful when a vehicle is not in use, or when a vehicle is being towed to a separate location. These securing features can also be used to prevent an unwanted or undesirable change to the transmission of a vehicle.

SUMMARY OF THE INVENTION

[0003] According to an aspect of the present disclosure, a selection assembly for a vehicle includes a lever that is operable between at least a park position and a neutral position. A solenoid is operable between a first position and a second position. A selector lock is operated by the solenoid to selectively lock the lever when the lever is in the park position and when the lever is in the neutral position. A controller is in communication with the lever, the solenoid and a brake pedal, wherein the controller operates the solenoid in response to predetermined operational movements of the lever and the brake pedal.

[0004] According to another aspect of the present disclosure, a selector lock for a selection assembly includes an actuator that is operable between a first position and a second

position. A park blocker is operable between a park-lock position that corresponds to the first position of the actuator and a park-unlock position that corresponds to the second position of the actuator. A neutral blocker is operable between a neutral-lock position that corresponds to the second position of the actuator and a neutral-unlock position that corresponds to the first position of the actuator. A linkage attaches the park blocker with the neutral blocker.

[0005] According to another aspect of the present disclosure, a selector lock for a selection assembly includes an actuator that is operable between a first position and a second position. A park blocker is operable between a park-lock position that corresponds to the first position of the actuator and a park-unlock position that corresponds to the second position of the actuator. A neutral blocker is operable between a neutral-lock position that corresponds to the second position of the actuator and a neutral-unlock position that corresponds to the first position of the actuator. A linkage attaches the park blocker with the neutral blocker.

[0006] These and other features, advantages, and objects of the present invention will be further understood and appreciated by those skilled in the art by reference to the following specification, claims, and appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] In the drawings:

[0008] FIG. 1 is a perspective view of a passenger cabin of a vehicle that incorporates an aspect of the selection assembly that incorporates an aspect of the selector lock;

[0009] FIG. 2 is a perspective view of the selection assembly that incorporates an aspect of the selector lock and shown contained within a support housing;

[0010] FIG. 3 is an exploded perspective view of the selection assembly of FIG. 2;

[0011] FIG. 4 is a first side elevation view of the selection assembly of FIG. 2, showing the actuator in a first position with the lever in the neutral position and also showing the lever in dashed line to reflect the park position of the selection assembly;

[0012] FIG. 5 is a second side elevation view of the selection assembly of FIG. 2, showing the actuator in the first position with the lever in the neutral position and also showing the lever in dashed line to reflect the park position of the selection assembly;

[0013] FIG. 6 is a side elevation view of the selection assembly of FIG. 4 with the support housing removed and showing the actuator in a first position;

[0014] FIG. 7 is a side elevation view of the selection assembly of FIG. 5 and shown with the support housing removed;

[0015] FIG. 8 is a side elevation view of the selection assembly of FIG. 4 and showing the solenoid in a second position with the lever in the neutral position and also showing the lever in dashed line to reflect the park position of the selection assembly;

[0016] FIG. 9 is a side elevation view of the selection assembly of FIG. 5 and showing the actuator in the second position with the lever in the neutral position and also showing the lever in dashed line to reflect the park position of the selection assembly;

[0017] FIG. 10 is a side elevation view of the selection assembly of FIG. 8 and shown with the support housing removed; and

[0018] FIG. 11 is a side elevation view of the selection assembly of FIG. 9 and showing the support housing removed.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0019] Reference will now be made in detail to the present preferred embodiments of the disclosure, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numerals will be used throughout the drawings to refer to the same or like parts. In the drawings, the depicted structural elements are not to scale and certain components are enlarged relative to the other components for purposes of emphasis and understanding.

[0020] As required, detailed embodiments of the present disclosure are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the invention that may be embodied in various and alternative forms. The figures are not necessarily to a detailed design; some schematics may be exaggerated or minimized to show function overview. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a representative basis for teaching one skilled in the art to variously employ the present invention.

[0021] For purposes of description herein, the terms “upper,” “lower,” “right,” “left,” “rear,” “front,” “vertical,” “horizontal,” and derivatives thereof shall relate to the concepts as oriented in FIG. 1. However, it is to be understood that the concepts may assume various alternative orientations, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings, and described in the following specification are simply exemplary embodiments of the inventive concepts defined in the appended claims. Hence, specific dimensions and other physical characteristics relating to the embodiments disclosed herein are not to be considered as limiting, unless the claims expressly state otherwise.

[0022] The present illustrated embodiments reside primarily in combinations of method steps and apparatus components related to a selection assembly for a vehicle that includes a selector lock that can secure a selector in each of a park position and a neutral position through the use of a single actuator. Accordingly, the apparatus components and method steps have been represented, where appropriate, by conventional symbols in the drawings, showing only those specific details that are pertinent to understanding the embodiments of the present disclosure so as not to obscure the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein. Further, like numerals in the description and drawings represent like elements.

[0023] As used herein, the term “and/or,” when used in a list of two or more items, means that any one of the listed items can be employed by itself, or any combination of two or more of the listed items, can be employed. For example, if a composition is described as containing components A, B, and/or C, the composition can contain A alone; B alone; C alone; A and B in combination; A and C in combination; B and C in combination; or A, B, and C in combination.

[0024] In this document, relational terms, such as first and second, top and bottom, and the like, are used solely to distinguish one entity or action from another entity or action, without necessarily requiring or implying any actual such relationship or order between such entities or actions. The terms “comprises,” “comprising,” or any other variation thereof, are intended to cover a non-exclusive inclusion, such that a process, method, article, or apparatus

that comprises a list of elements does not include only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. An element preceded by "comprises . . . a" does not, without more constraints, preclude the existence of additional identical elements in the process, method, article, or apparatus that comprises the element.

[0025] As used herein, the term "about" means that amounts, sizes, formulations, parameters, and other quantities and characteristics are not and need not be exact, but may be approximate and/or larger or smaller, as desired, reflecting tolerances, conversion factors, rounding off, measurement error and the like, and other factors known to those of skill in the art. When the term "about" is used in describing a value or an end-point of a range, the disclosure should be understood to include the specific value or end-point referred to. Whether or not a numerical value or end-point of a range in the specification recites "about," the numerical value or end-point of a range is intended to include two embodiments: one modified by "about," and one not modified by "about." It will be further understood that the end-points of each of the ranges are significant both in relation to the other end-point, and independently of the other end-point.

[0026] The terms "substantial," "substantially," and variations thereof as used herein are intended to note that a described feature is equal or approximately equal to a value or description. For example, a "substantially planar" surface is intended to denote a surface that is planar or approximately planar. Moreover, "substantially" is intended to denote that two values are equal or approximately equal. In some embodiments, "substantially" may denote values within about 10% of each other, such as within about 5% of each other, or within about 2% of each other.

[0027] As used herein the terms "the," "a," or "an," mean "at least one," and should not be limited to "only one" unless explicitly indicated to the contrary. Thus, for example, reference to "a component" includes embodiments having two or more such components unless the context clearly indicates otherwise.

[0028] Referring now to FIGS. 1-11, reference numeral 10 generally refers to a selection assembly that is incorporated within a vehicle 12 for operating various electrical and/or

mechanical components of the vehicle 12. Typically, the selection assembly 10 is used for adjusting various positions of a transmission 14 for operating the vehicle 12. This transmission 14 can include various gear positions and the selection assembly 10 includes selector positions 16 that correspond to the gear positions. These selector positions 16 typically include, but are not limited to, a park position 18, a reverse position 20, a neutral position 22, a drive position 24, and at least one manual selection position. The selection assembly 10 is incorporated within a passenger cabin 26 of the vehicle 12 to be accessed by the operator of the vehicle 12 who sits within a driver's seat 28 within the passenger cabin 26. From this position, the operator has access to various controls of the vehicle 12. These controls include, but are not limited to, a selector 30 of the selection assembly 10, an accelerator pedal 32, a brake pedal 34, the steering wheel 36, and various user interface controls positioned within the console of the passenger cabin 26.

[0029] Referring again to FIGS. 1-11, the selection assembly 10 is incorporated within the vehicle 12. The selection assembly 10 includes the selector 30, such as a lever 50, that is operable between at least the park position 18 and the neutral position 22. An actuator 52, typically in the form of a solenoid 54, is operable between a first position 56 and a second position. A selector lock 60 is operated by the solenoid 54 to selectively lock the lever 50 when the lever 50 is in the park position 18. The selector lock 60 also selectively locks the lever 50 when the lever 50 is in the neutral position 22. A controller 62 is in communication with the lever 50, the solenoid 54 and the brake pedal 34. The controller 62 operates the solenoid 54 in response to predetermined operational movements of the lever 50 and the brake pedal 34.

[0030] In an exemplary aspect of the device, as exemplified in FIGS 4-11, when the lever 50 is in the park position 18 (shown in dashed line), the selector lock 60 is in the first position 56 to selectively secure the lever 50 in the park position 18. The lever 50 includes an operable positioning pin 70 that engages a selection surface 72 of the selector interface. The position of the lever 50 also locates the positioning pin 70 in a corresponding section of the selection surface 72. This interaction corresponds to a selection of the desired gear of the transmission 14, either directly, or through a shift-by-wire mechanism. Subsequently, when the brake pedal 34 is operated to an activated position 74 (shown in FIGS. 8-11), the selector lock 60 is operated

by the controller 62 from the first position 56 to the second position 58. The selector lock 60 in the second position 58 releases the lever 50, typically the positioning pin 70 of the lever 50, to allow for operation of the lever 50 away from the park position 18. When the lever 50 is moved out of the park position 18, the controller 62 senses the operational movement of the lever 50 and operates the solenoid 54 from the second position 58 back to the first position 56.

[0031] Referring again to FIGS. 4-11, when the lever 50 of the selection assembly 10 is moved to the neutral position 22, the controller 62 senses this movement of the lever 50 and operates the selector lock 60 from the first position 56 to the second position 58. In this second position 58, the selector lock 60 secures the lever 50 in the neutral position 22. From this neutral position 22, when the brake pedal 34 is operated to the activated position 74, the selector lock 60 operates the solenoid 54 from the second position 58 and back to the first position 56. When the selector lock 60 is moved to the first position 56, the selector lock 60 releases the lever 50 for operation away from the neutral position 22.

[0032] When the lever 50 is operated back into the park position 18, the selector lock 60 operates to secure the lever 50 in the park position 18 until such time as the brake pedal 34 is operated to the activated position 74 that releases the lever 50 from operation away from the park position 18, as described herein.

[0033] Referring now to FIGS. 2-11, the selection assembly 10 includes a support housing 80. The various components of the selection assembly 10 and the selector lock 60 are coupled with the support housing 80 to allow for operational movement of the various components of the selection assembly 10 and the selector lock 60. The selector lock 60 includes a park blocker 82 that is operable between a park-lock position 84 that corresponds to the first position 56 of the solenoid 54 and a park-unlock position 86 that corresponds to the second position 58 of the solenoid 54. The selector lock 60 also includes a neutral blocker 88 that is operable between a neutral-lock position 90 that corresponds to the second position 58 of the solenoid 54 and a neutral-unlock position 92 that corresponds to the first position 56 of the solenoid 54. A linkage 94 extends between the park blocker 82 and the neutral blocker 88 and provides for contemporaneous operation of the park blocker 82 and the neutral blocker 88 when the solenoid 54 operates between the first and second positions 56, 58.

[0034] Accordingly, the first position 56 of the solenoid 54 corresponds to the park-lock position 84 of the park blocker 82 as well as the neutral-unlock position 92 of the neutral blocker 88. Conversely, the second position of the solenoid 54 corresponds to the park-unlock position 86 of the park blocker 82 and the neutral-lock position 90 of the neutral blocker 88. In this manner, the first position 56 of the solenoid 54 is able to selectively secure the lever 50 in the park position 18 and the second position 58 of the solenoid 54 is able to selectively secure the lever 50 in the neutral position 22. This combination of blocking features is able to be accomplished through operation of a single common solenoid 54 or other similar actuator 52.

[0035] Referring again to FIGS. 4-11, to operate the park blocker 82 and the neutral blocker 88, the solenoid 54 can include a plunger 110 that is attached to one of the park blocker 82 and the neutral blocker 88. Typically, the plunger 110 is attached to the park blocker 82 and the linkage 94 is integrally formed with at least the park blocker 82. Through this configuration, when the solenoid 54 operates between the first and second positions 56, 58, the park blocker 82 operates between the park-lock position 84 and the park-unlock position 86. Contemporaneously, the park blocker 82 translates the motion of the park blocker 82 to the neutral blocker 88 and simultaneously operates the neutral blocker 88 between the neutral-unlock position 92 and the neutral-lock position 90. In certain aspects of the device, the linkage 94 can extend from each of the park blocker 82 and the neutral blocker 88 and meet at a linkage interface 96 that is positioned between the park blocker 82 and the neutral blocker 88.

[0036] According to the various aspects of the device, when the lever 50 is in the park position 18, only operation of the park blocker 82 effects the operation of the lever 50. Operation of the neutral blocker 88 occurs between the neutral-lock position 90 and the neutral-unlock position 92. The neutral blocker 88 is typically ineffectual with respect to the lever 50 when the lever 50 is in the park position 18. Similarly, when the lever 50 is in the neutral position 22, the park blocker 82 is able to operate between the park-lock position 84 and the park-unlock position 86. These positions are generally ineffectual with respect to the lever 50 when the lever 50 is in the neutral position 22.

[0037] As exemplified in FIGS. 4, 6, 8 and 10, the lever 50 includes the positioning pin 70 that interacts with the park blocker 82. The positioning pin 70 also interacts with a park-lock

switch 120 that is incorporated within the selection assembly 10. When the solenoid 54 is in the first position 56, the park blocker 82 is in the park-lock position 84. With the lever 50 in the park position 18, the positioning pin 70 is secured between the park blocker 82 and the park-lock switch 120. The positioning pin 70 also interacts with the park-lock switch 120 such that these components mechanically and electrically secure the lever 50 in the park position 18. When the solenoid 54 moves to the second position 58, the park blocker 82 moves away from the park-lock switch 120 and provides a clearance 122 through which the positioning pin 70 of the lever 50 can be moved away from the park position 18. When the lever 50 is moved from the park position 18, the positioning pin 70 also disengages and deactivates the park-lock switch 120.

[0038] As described herein, operation of the brake pedal 34 to the activated position 74 serves to operate the solenoid 54 between the first and second positions 56, 58. This motion of the brake pedal 34 to the activated position 74 serves to move the park blocker 82 from the park-lock position 84 to the park-unlock position 86 that creates the clearance 122 for allowing the positioning pin 70 and the lever 50 to be operated away from the park position 18. As described herein, once the lever 50 is moved out of the park position 18, the solenoid 54 is operated from the second position 58 back to the first position 56 to relocate the park blocker 82 into the park-lock position 84.

[0039] When the lever 50 is returned to the park position 18, the park blocker 82 is biased toward the park-lock position 84. Motion of the lever 50 into the park position 18 also translates the positioning pin 70 into engagement with the park blocker 82 in the park-lock position 84. This motion of the lever 50 and the positioning pin 70 is able to engage and bias the park blocker 82 away from the park-lock position 84 to allow the lever 50 to efficiently move into the park position 18. Once the lever 50 is in the park position 18 and the positioning pin 70 passes the park blocker 82, the park blocker 82 is biased back into the park-lock position 84.

[0040] In certain aspects of the device, movement of the lever 50 toward the park position 18 can also cooperatively operate the controller 62 to move the solenoid 54 from the first position 56 to the second position 58 to create the clearance 122. This clearance 122 can

also allow the positioning pin 70 to bypass the park blocker 82 in the park-unlock position 86 to enter into the park position 18. Once the lever 50 and the positioning pin 70 are in the park position 18, the controller 62 can operate the solenoid 54 to return the park blocker 82 to the park-lock position 84.

[0041] Within the selection assembly 10, the lever 50 includes a blocking assembly 130 that rotationally operates with the lever 50 between the plurality of selection positions. The blocking assembly 130 includes a neutral notch 132 that aligns with a neutral protrusion 134 of the neutral blocker 88 when the lever 50 is in the neutral position 22. The neutral notch 132 is configured to receive the neutral protrusion 134 when the solenoid 54 is in the second position 58. During operation, when the operator moves the lever 50 to the neutral position 22, the solenoid 54 activates and moves from the first position 56 to the second position 58. This operation manipulates the neutral protrusion 134 of the neutral blocker 88 from the neutral-unlock position 92 to the neutral-lock position 90. This places the neutral protrusion 134 within the neutral notch 132 to prevent operation of the lever 50 away from the neutral position 22. When the operator moves the brake pedal 34 to the activated position 74, the solenoid 54 operates from the second position 58 back to the first position 56. This operation of the solenoid 54 moves the neutral blocker 88 from the neutral-lock position 90 to the neutral-unlock position 92 and removes the neutral protrusion 134 from the neutral notch 132 of the blocking assembly 130. Accordingly, operation of the brake to the activated position 74 allows the operator to manipulate the lever 50 away from the neutral position 22.

[0042] The actuator 52 is operated through the application of an electrical current to the actuator 52. In the case of a solenoid 54, the electrical current activates the solenoid 54 to move the solenoid 54 from the first position 56 to the second position 58. Accordingly, in a resting state 140, the solenoid 54 operates, or is biased, to the first position 56. In order to achieve this resting state 140, the solenoid 54 can include a plunger 110 that operates along a longitudinal axis between the first and second positions 56, 58. Additionally, the plunger 110 can include a biasing mechanism 142 that biases the plunger 110 toward the first position 56. In this manner, when the solenoid 54 is activated through the application of an electrical current, the plunger 110 is moved, as well as the park blocker 82 and the neutral blocker 88, to

the second position 58. This motion of the solenoid 54 to the second position 58 overcomes the biasing force of the biasing mechanism 142. When the electrical current is removed, the biasing mechanism 142 biases the plunger 110, as well as the park blocker 82 and the neutral blocker 88, back to the first position 56. During this operation of the plunger 110 between the first and second positions 56, 58, the plunger 110 is typically attached to the park blocker 82. The linkage 94 extending between the park blocker 82 and the neutral blocker 88 provides the contemporaneous operation of these components of the selector lock 60.

[0043] According to the various aspects of the device, the park blocker 82 operates about a first rotational axis 150 and the neutral blocker 88 operates about a second rotational axis 152. In the illustrated aspect of the device, operation of the solenoid 54 between the first and second positions 56, 58 serves to operate the park blocker 82 and the neutral blocker 88 in opposing rotational directions. Accordingly, when the solenoid 54 moves from the first position 56 to the second position 58, the park blocker 82 and the neutral blocker 88 rotate toward one another and in opposing rotational directions. When the lever 50 is in the park position 18, this operative movement moves the park blocker 82 away from the park-lock switch 120 to create the clearance 122 for the positioning pin 70.

[0044] This movement also moves the neutral protrusion 134 toward the blocking assembly 130 of the lever 50. When the lever 50 is in the park position 18, the blocking assembly 130 includes an operating recess 160 that is configured to retrieve the neutral protrusion 134 when the lever 50 is distal from the neutral position 22. This allows the selector lock 60 to freely move between the first and second positions 56, 58 when the lever 50 is moved away from the park position 18. When the lever 50 is in the neutral position 22, the neutral protrusion 134 moves into the neutral notch 132.

[0045] Typically, the solenoid 54 will only move to the second position 58 when the lever 50 is in the park position 18 or in the neutral position 22. When the lever 50 is in any of the other positions, the solenoid 54 will typically be in the first position 56 such that the neutral protrusion 134 is positioned outside of the blocking assembly 130. In this manner, the neutral protrusion 134 moves within the area defined by the blocking assembly 130 only when the lever 50 moves to the park position 18, to be received within the operating recess 160, and to

the neutral position 22 where the neutral protrusion 134 is received within the neutral notch 132.

[0046] Referring again to FIGS. 1-11, the selector lock 60 for the selection assembly 10 includes the actuator 52 that is operable between the first position 56 and the second position 58. The park blocker 82 is operable between the park-lock position 84 that corresponds to the first position 56 of the actuator 52 and a park-unlock position 86 that corresponds to the second position 58 of the actuator 52. A neutral blocker 88 is also positioned within the selector lock 60. The neutral blocker 88 is operable between the neutral-lock position 90 that corresponds to the second position 58 of the actuator 52, and a neutral-unlock position 92 that corresponds to the first position 56 of the actuator 52. The linkage 94 attaches the park blocker 82 to the neutral blocker 88 and provides for contemporaneous operation of the park blocker 82 and the neutral blocker 88 when the common actuator 52 moves between the first and second positions 56, 58.

[0047] According to the various aspects of the device, the actuator 52 is typically in the form of a solenoid 54. The solenoid 54 can be a linear-operating solenoid that operates along the longitudinal axis between the first and second positions 56, 58. It is also contemplated that the solenoid 54 can operate in a rotational direction about an actuator rotational axis. In either of these conditions, the actuator 52 operates between the first and second positions 56, 58 to operate the park blocker 82 and the neutral blocker 88 in a reciprocating manner to selectively lock the lever 50 in either the park position 18 or the neutral position 22, depending upon the particular operating condition of the vehicle 12 and the selection assembly 10.

[0048] Referring again to FIGS. 4-11, the linkage 94 is typically integral with at least one of, or each of, the park blocker 82 and the neutral blocker 88. In this configuration, the linkage can use the linkage interface 96 to operationally connect between the park blocker and the neutral blocker 88. It is also contemplated that the linkage 94 can be a separate piece that extends between the park blocker 82 and the neutral blocker 88. It is also contemplated that the linkage 94 can be integral with at least the neutral blocker 88. In these particular conditions, the linkage 94 synchronizes the movement of the park blocker 82 and the neutral blocker 88

such that the single solenoid 54 can operate each of the park blocker 82 and the neutral blocker 88 contemporaneously and without the need for a supplemental actuator 52.

[0049] Referring again to FIGS. 2-11, the selection assembly 10 includes a detent mechanism 170 having a detent pin 172 and a detent surface 174 that cooperate to align and temporarily position the lever 50 in a particular selector position 16. The detent surface 174 includes detent recesses 176 that cooperate with the detent pin 172 to align the lever 50 in any one of the selector positions 16. During operation of the lever 50 at least between the park and neutral positions 18, 22, the controller 62 senses at least the operative movement of the lever 50 for operating the solenoid 54 between the first and second positions 56, 58. It is contemplated that the controller 62 can be in communication with the detent pin 172 or other portion of the detent mechanism 170, or one or more positioning sensors in communication with the lever 50 for sensing the operational movements of the lever 50 between the various selector positions 16.

[0050] As described herein, when the lever 50 moves away from the park position 18, this movement is communicated to the controller 62, which, in turn, operates the solenoid 54 from the second position 58 back to the first position 56. Similarly, when the lever 50 is moved into the neutral position 22, this movement of the lever 50 is communicated to the controller 62, which, in turn, operates the solenoid 54 from the first position 56 to the second position 58, such that the neutral protrusion 134 can be positioned within the neutral notch 132 of the blocking assembly 130.

[0051] As described herein, movement of the solenoid 54 between the first and second positions 56, 58 is actuated through operation of the brake pedal 34 as well as through operation of the lever 50, through the various selector positions 16, and relative to the park position 18 and neutral position 22 in particular.

[0052] Referring again to FIGS. 1-11, the selection assembly 10 for the vehicle 12 includes the lever 50 that is coupled with the housing for the selection assembly 10. The lever 50 is operable between the plurality of selector positions 16 that includes the park position 18, the reverse position 20, the neutral position 22 and the drive position 24 as well as other selector positions 16 that are commonly used within various vehicles 12. The park blocker 82 is

coupled with the housing for the selection assembly 10. The park blocker 82 selectively operates between the park-lock position 84 and the park-unlock position 86. The park blocker 82 selectively locks the lever 50 when the lever 50 is in the park position 18. This locking feature is activated through use of an interference member of the lever 50, such as the positioning pin 70, that is contained between the park blocker 82 and the park-lock switch 120. This interference member also interacts with a park-lock switch 120 to engage and disengage the electrical lock for the selection assembly 10.

[0053] The neutral blocker 88 is coupled with the housing for the selection assembly 10 as well. The neutral blocker 88 selectively operates between the neutral-unlock position 92 that corresponds to the park-lock position 84 of the park blocker 82. The neutral blocker 88 also operates to the neutral-lock position 90 that corresponds to the park-unlock position 86 of the park blocker 82. The neutral blocker 88 in the neutral-lock position 90 selectively locks the lever 50 within the neutral position 22.

[0054] The solenoid 54 is coupled to the park blocker 82 and the neutral blocker 88 and is operable between the first position 56 that corresponds to the park-lock position 84 and the second position 58 that corresponds to the park-unlock position 86. The linkage 94 couples the park blocker 82 with the neutral blocker 88. Accordingly, operation of the solenoid 54 simultaneously and/or contemporaneously operates the park blocker 82 and the neutral blocker 88 such that a single common actuator 52 can operate the selector lock 60 without the need for an additional actuator 52.

[0055] Referring again to FIGS. 1-11, the selector lock 60 is configured to operate according to the movements of the brake pedal 34 and the lever 50. When the engine of the vehicle 12 is running and the lever 50 is in the park position 18, the solenoid 54 does not receive any electrical current and is maintained in the first position 56. In this position, the park blocker 82 is in the park-lock position 84 and the positioning member of the lever 50 is secured between the park blocker 82 and a portion of the housing for the selection assembly 10. In addition, the positioning pin 70 is engaged with the park-lock switch 120 to at least electrically lock the lever 50 in the park position 18. When the brake pedal 34 is operated to the activated position 74, an electrical current is delivered to the solenoid 54 and the solenoid 54 is moved to

the second position 58. The plunger 110 operates the park lock to the park-unlock position 86 to form the clearance 122 through which the positioning pin 70 can be moved away from the park position 18, along with the lever 50 and the blocking assembly 130 of the lever 50. Additionally, the positioning pin 70 disengages the park-lock switch 120 and deactivates the electrical park lock. When the lever 50 is moved away from the park position 18, the electrical current to the solenoid 54 is stopped and the plunger 110 returns to the first position 56. In this manner, the park blocker 82 returns to its previous position such that the park blocker 82 can be biased into the park-lock position 84 when the lever 50 is returned to the park position 18.

[0056] As described herein, during this operation of the solenoid 54 into the second position and back to the first position 56 as the lever 50 is moved away from the park position 18, the neutral blocker 88 is simultaneously operating between the neutral-unlock position 92 and the neutral-lock position 90. When the lever 50 is moved away from the park position 18, the neutral protrusion 134 of the neutral blocker 88 is moved from the neutral-unlock position 92 that is outside of the blocking assembly 130 and into the neutral-lock position 90 such that the neutral protrusion 134 is moved into the operating recess 160 of the blocking assembly 130. When the solenoid 54 returns to the first position 56 after the lever 50 leaves the park position 18, the neutral protrusion 134 of the neutral blocker 88 is moved outside of the area defined by the blocking assembly 130. In this position, the lever 50 can be freely manipulated between the various selector positions 16.

[0057] When the lever 50 is moved to the neutral position 22, the controller 62 senses this movement of the lever 50 and delivers an electrical current to the solenoid 54 to move the plunger 110 of the solenoid 54 from the first position 56 to the second position 58. In the second position 58, the park blocker 82 and the linkage 94 that is incorporated with the park blocker 82 are rotated to the park-unlock position 86. Contemporaneously, the neutral blocker 88 is moved from the neutral-unlock position 92 to the neutral-lock position 90. Because the lever 50 is in the neutral position 22, the neutral notch 132 is aligned with the neutral protrusion 134. Accordingly, the neutral protrusion 134 operates according to the movement of the neutral blocker 88 and enters the neutral notch 132. This engagement between the

neutral protrusion 134 and the neutral notch 132 selectively secures the lever 50 in the neutral position 22. As described herein, the park blocker 82 is also moved to the park-unlock position 86.

[0058] When the operator desires to move the lever 50 away from the neutral position 22, the brake pedal 34 can be operated to the activated position 74. This movement of the brake pedal 34 communicates to the controller 62 to deliver the electrical current to the solenoid 54 to move the plunger 110 from the second position 58 to the first position 56. This movement of the plunger 110 operates the park blocker 82 back to the park-lock position 84. The linkage 94 of the park blocker 82 contemporaneously operates the neutral blocker 88 from the neutral-lock position 90 to the neutral-unlock position 92. Once in the neutral-unlock position 92, the lever 50 is able to be moved away from the neutral position 22 to any of the other selector positions 16.

[0059] According to the various aspects of the device, when the vehicle 12 is not operated, no electrical current is typically delivered to the solenoid 54. Accordingly, an operator can freely move the lever 50 between the reverse position 20, the neutral position 22, and the drive position 24, as the selector lock 60 is not manipulated from the first position 56 to the second position 58. Movement of the lever 50 into the park position 18 can secure the lever 50 in the park position 18, as described herein, as the park blocker 82 is in the park-lock position 84 and is biased to this position by the biasing mechanism 142 of the solenoid 54.

[0060] According to the various aspects of the device, the selection assembly 10 having the various configurations of the selector lock 60 can be utilized within any one of various vehicles 12. Such vehicles can include, but are not limited to, commuter vehicles, fleet vehicles, family vehicles, cars, SUVs, trucks, mass transit vehicles, and other similar vehicles that incorporate a lever 50 within a selection assembly 10.

[0061] According to the various aspects of the device, the selection assembly 10 incorporates a lever 50. It is also contemplated that the selection assembly 10 can include a dial, rotary member, laterally operable member, or other similar selector interface that can be used to manipulate the transmission 14 between the various selector positions 16. It is also

contemplated that the selector interface can be used in combination with a wire-operated selector interface, as well as a shift-by-wire interface.

[0062] It is to be understood that variations and modifications can be made on the aforementioned structure without departing from the concepts of the present invention, and further it is to be understood that such concepts are intended to be covered by the following claims unless these claims by their language expressly state otherwise.

What is claimed is:

1. A selection assembly for a vehicle, the selection assembly comprising:

a lever that is operable between at least a park position and a neutral position;

a solenoid that is operable between a first position and a second position;

a selector lock that is operated by the solenoid to selectively lock the lever when the lever is in the park position and when the lever is in the neutral position; and

a controller in communication with the lever, the solenoid and a brake pedal, wherein the controller operates the solenoid in response to predetermined operational movements of the lever and the brake pedal.

2. The selection assembly of claim 1, wherein when the lever is in the park position, the selector lock is in the first position to secure the lever in the park position.

3. The selection assembly of any one of claims 1-2, wherein when the brake pedal is operated to an activated position, the selector lock operates from the first position to the second position, wherein the selector lock in the second position releases the lever for operation away from the park position.

4. The selection assembly of any one of claims 1-3, wherein when the lever is moved out of the park position the controller operates the solenoid from the second position to the first position.

5. The selection assembly of any one of claims 1-4, wherein when the lever is moved to the neutral position, the controller operates the selector lock from the first position to the second position, wherein the selector lock in the second position secures the lever in the neutral position.

6. The selection assembly of any one of claims 1-5, wherein when the brake pedal is operated to an activated position, the selector lock operates from the second position to the first position, wherein the selector lock in the second position releases the lever for operation away from the neutral position.

7. The selection assembly of any one of claims 1-6, wherein operation of the lever into the park position secures the lever in the park position until such time as the brake pedal is moved to an activated position.

8. The selection assembly of any one of claims 1-7, wherein the lever includes a blocking assembly that rotationally operates with the lever between a plurality of selection positions that includes the park position and the neutral position.

9. The selection assembly of claim 8, wherein the blocking assembly includes a neutral notch that aligns with a neutral protrusion of a neutral blocker when the lever is in the neutral position, wherein the neutral notch receives the neutral protrusion when the lever is in the second position.

10. The selection assembly of claim 9, wherein the blocking assembly includes an operating recess that receives the neutral protrusion when the lever is distal from the neutral position and the solenoid is in the second position.

11. The selection assembly of any one of claims 1-10, wherein a park blocker engages a park-lock switch when the lever is in the park position and the solenoid is in the first position, and wherein when the brake pedal is actuated, the solenoid moves to the second position and the park blocker moves to a park-unlock position to disengage the park blocker from the park-lock switch.

12. The selection assembly of any one of claims 1-11, wherein the selector lock comprises:

a park blocker that is operable between a park-lock position that corresponds to the first position of the solenoid and a park-unlock position that corresponds to the second position of the solenoid;

a neutral blocker that is operable between a neutral-lock position that corresponds to the second position of the solenoid and a neutral-unlock position that corresponds to the first position of the solenoid; and

a linkage that attaches the park blocker with the neutral blocker.

13. The selection assembly of claim 12, wherein the solenoid includes a plunger that is attached to the park blocker and the linkage is integrally formed with at least the park blocker.

14. The selection assembly of any one of claims 12-13, wherein the park blocker cooperates with a park lock that selectively prevents operation of the lever away from the park position, wherein the park blocker in the park-lock position activates the park lock, and wherein when the solenoid is operated to the second position while the lever is in the park position, the park lock is deactivated.

15. The selection assembly of claim 14, wherein the park blocker operates about a first rotational axis and the neutral blocker operates about a second rotational axis, wherein operation of the solenoid operates the park blocker and the neutral blocker in opposing rotational directions.

16. A selector lock for a selection assembly, the selector lock comprising:

an actuator that is operable between a first position and a second position;

a park blocker that is operable between a park-lock position that corresponds to the first position of the actuator and a park-unlock position that corresponds to the second position of the actuator;

a neutral blocker that is operable between a neutral-lock position that corresponds to the second position of the actuator and a neutral-unlock position that corresponds to the first position of the actuator; and

a linkage that attaches the park blocker with the neutral blocker.

17. The selector lock of claim 16, wherein the actuator is a solenoid.

18. The selector lock of claim 17, wherein the solenoid includes a plunger that operates along a longitudinal axis between the first and second positions.

19. The selector lock of claim 18, wherein the plunger includes a biasing mechanism that biases the plunger to the first position.

20. The selector lock of claim 19, wherein the solenoid is selectively energized by an electrical current to operate the plunger to the second position.

21. The selector lock of any one of claims 17-20, wherein solenoid operates in a rotational direction about an actuator rotational axis.

22. The selector lock of any one of claims 17-21, wherein the solenoid is operated by a controller that is in communication with a brake pedal of a vehicle and a lever of the selection assembly.

23. The selector lock of any one of claims 16-22, wherein the park blocker rotationally operates about a first rotational axis.

24. The selector lock of claim 23, wherein the neutral blocker operates about a second rotational axis.

25. The selector lock of claim 24, wherein the park blocker rotates about the first rotational axis and the neutral blocker contemporaneously operates about the second rotational axis, the park blocker and the neutral blocker also operating in opposing rotational directions.

26. The selector lock of any one of claims 16-25, wherein a lever includes a blocking assembly that rotationally operates with the lever between a plurality of selector positions.

27. The selector lock of claim 26, wherein the plurality of selector positions include a park position, a reverse position, a neutral position, and a drive position.

28. The selector lock of claim 27, wherein the blocking assembly includes a neutral notch that aligns with a neutral protrusion of the neutral blocker when the lever is in the neutral position, wherein the neutral notch receives the neutral protrusion when the actuator is in the second position.

29. The selector lock of claim 28, wherein the blocking assembly includes an operating recess that receives the neutral protrusion when the lever is distal from the neutral position and the actuator is in the second position.

30. The selector lock of any one of claims 22-29, wherein the park blocker engages a park-lock switch when the lever is in the park position and the solenoid is in the first position, and wherein when the brake pedal is actuated, the solenoid moves to the second position and the park blocker moves to the park-unlock position to disengage the park blocker from the park-lock switch.

31. The selector lock of any one of claims 16-30, wherein the actuator is attached to the park blocker and the linkage extends from the park blocker to the neutral blocker.

32. The selector lock of any one of claims 16-31, wherein the linkage is integral with at least one of the park blocker and the neutral blocker.

33. A selection assembly for a vehicle, the selection assembly comprising:

a lever coupled with a housing and that is operable between a plurality of positions that include a park position, a reverse position, a neutral position, and a drive position;

a park blocker coupled with the selector housing, wherein the park blocker selectively operates between a park-lock position and a park-unlock position, and wherein the park blocker selectively locks the lever when the lever is in the park position;

a neutral blocker coupled with the selector housing, wherein the neutral blocker selectively operates between a neutral-unlock position that corresponds to the park-lock position and a neutral-lock position that corresponds to the park-unlock position, and wherein the neutral blocker selectively locks the lever when the lever is in the neutral position;

a solenoid that is coupled to the park blocker and the neutral blocker and is operable between a first position that corresponds to the park-lock position and a second position that corresponds to the park-unlock position; and

a linkage that couples the park blocker with the neutral blocker, wherein operation of the solenoid simultaneously operates the park blocker and the neutral blocker.

34. The selection assembly of claim 33, wherein the lever includes a blocking assembly that cooperates with the neutral blocker to selectively retain the lever in the neutral position.

35. The selection assembly of any one of claims 33-34, wherein the solenoid includes a plunger that operates along a longitudinal axis between the first and second positions.

36. The selection assembly of claim 35, wherein the plunger includes a biasing mechanism that biases the plunger to the first position.

37. The selection assembly of claim 36, wherein the solenoid is selectively energized by an electrical current to operate the plunger to the second position.

38. The selection assembly of any one of claims 33-37, wherein solenoid operates in a rotational direction about an actuator rotational axis.

39. The selection assembly of any one of claims 33-38, wherein the solenoid is operated by a controller that is in communication with a brake pedal of the vehicle and a lever of the selection assembly.

40. The selection assembly of any one of claims 33-39, wherein the park blocker rotationally operates about a first rotational axis.

41. The selection assembly of claim 40, wherein the neutral blocker operates about a second rotational axis.

42. The selection assembly of claim 41, wherein the park blocker rotates about the first rotational axis and the neutral blocker contemporaneously operates about the second rotational axis, and wherein the park blocker and the neutral blocker operate in opposing rotational directions.

43. The selection assembly of any one of claims 33-42, wherein the lever includes a blocking assembly that rotationally operates with the lever between a plurality of selection positions.

44. The selection assembly of claim 43, wherein the blocking assembly includes a neutral notch that aligns with a neutral protrusion of the neutral blocker when the lever is in the neutral position, wherein the neutral notch receives the neutral protrusion when the solenoid is in the second position.

45. The selection assembly of claim 44, wherein the blocking assembly includes an operating recess that receives the neutral protrusion when the lever is distal from the neutral position and the solenoid is in the second position.

46. The selection assembly of any one of claims 39-45, wherein the park blocker engages a park-lock switch when the lever is in the park position and the solenoid is in the first position, and wherein when the brake pedal is actuated, the solenoid moves to the second position and the park blocker moves to the park-unlock position to disengage the park blocker from the park-lock switch.

47. The selection assembly of any one of claims 33-46, wherein the solenoid is attached to the park blocker and the linkage extends from the park blocker to the neutral blocker.

48. The selection assembly of claim 47, wherein the linkage is integral with at least the park blocker.

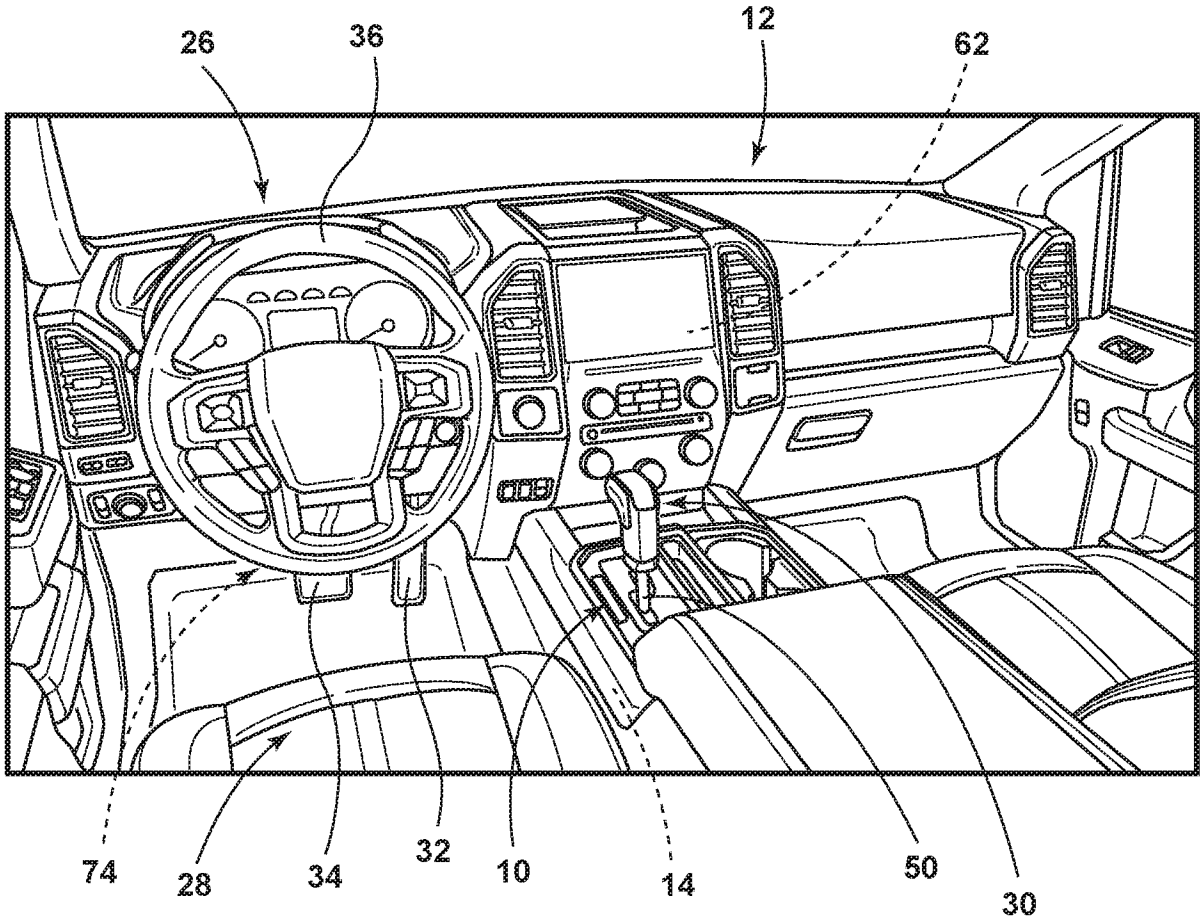

FIG. 1

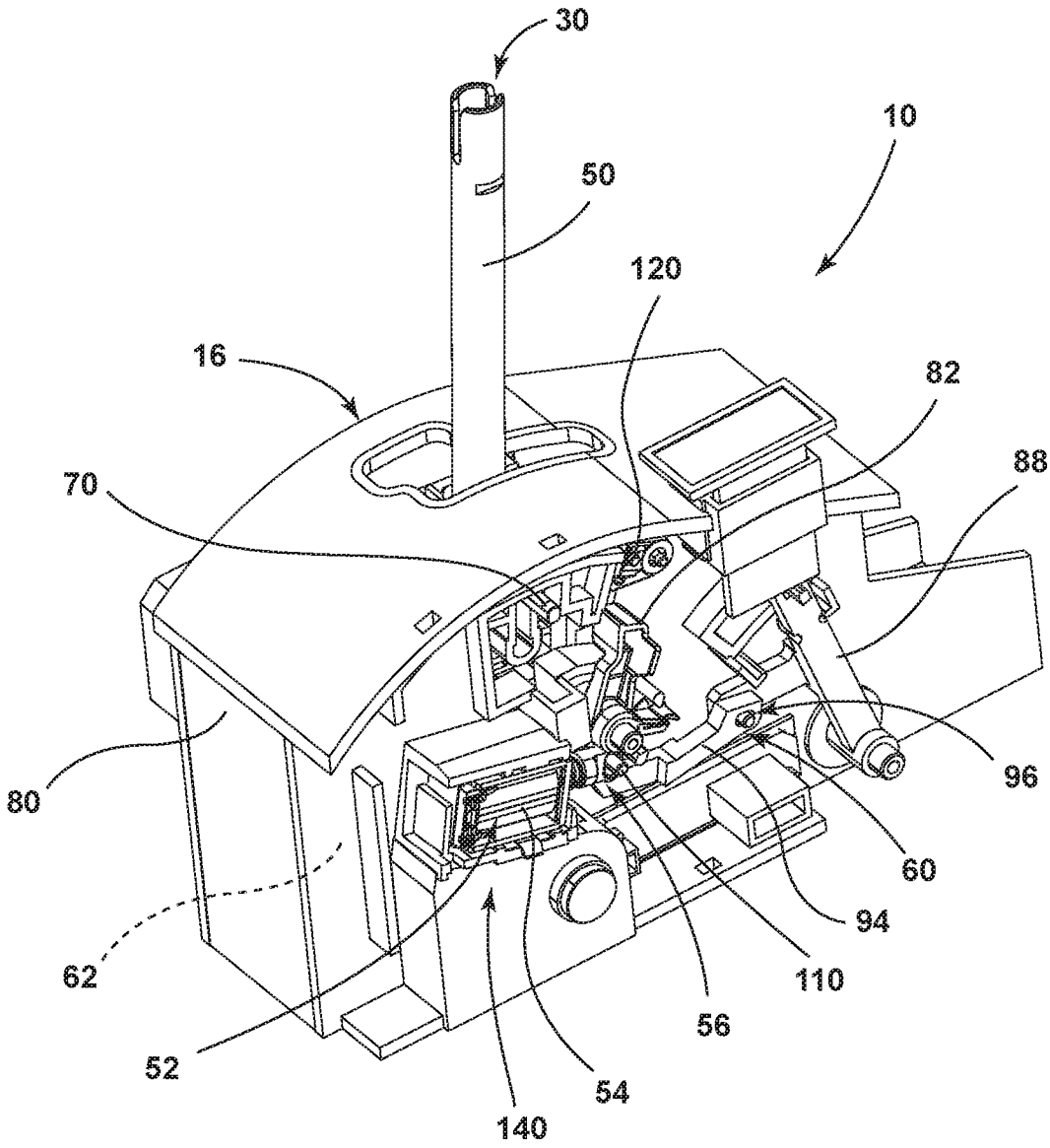

FIG. 2

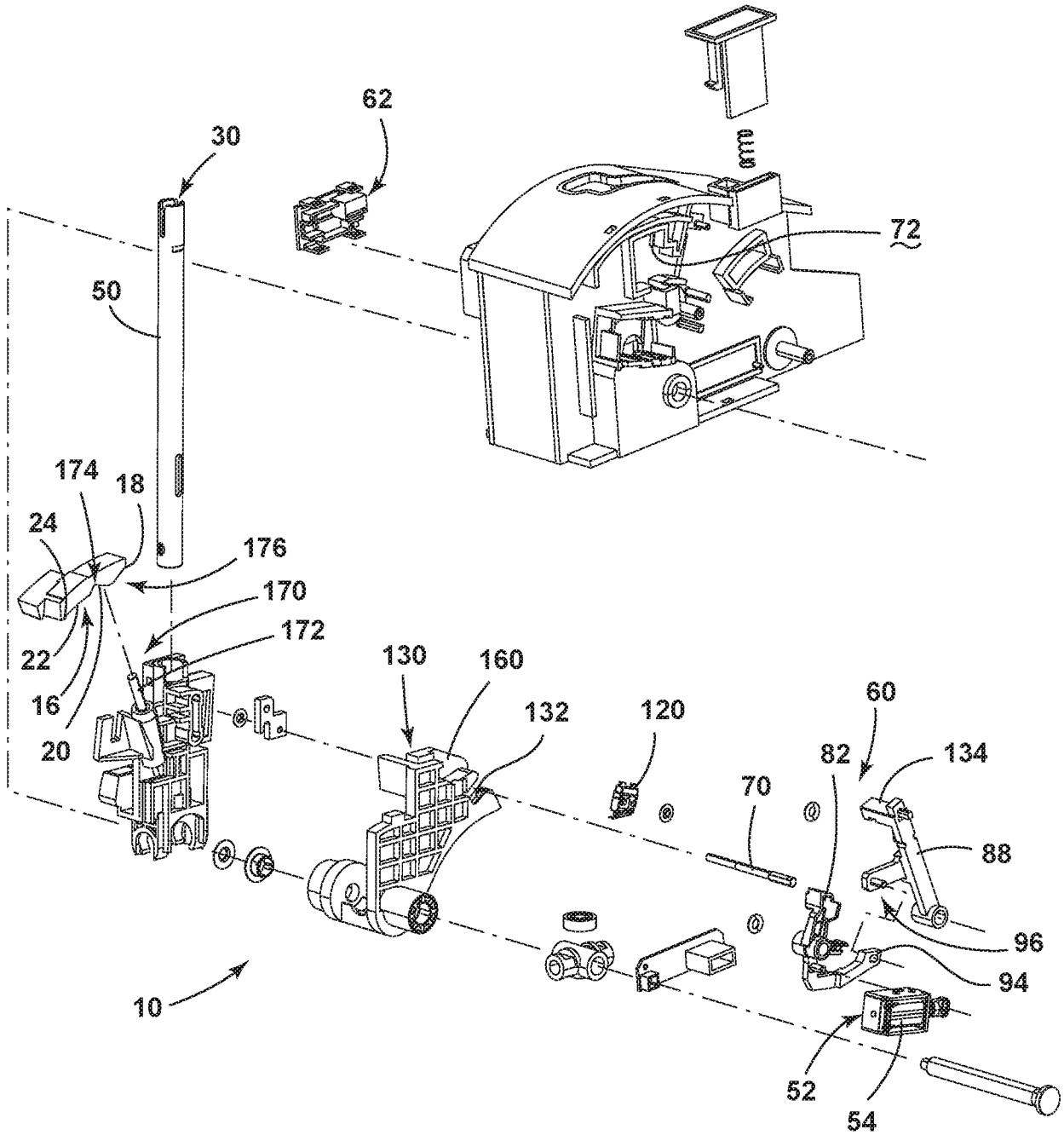
62
30
72
50
174
18
24
176
170
172
22
16
20
130
160
132
120
60
82
134
70
88
96
94
10
52
54

FIG. 3

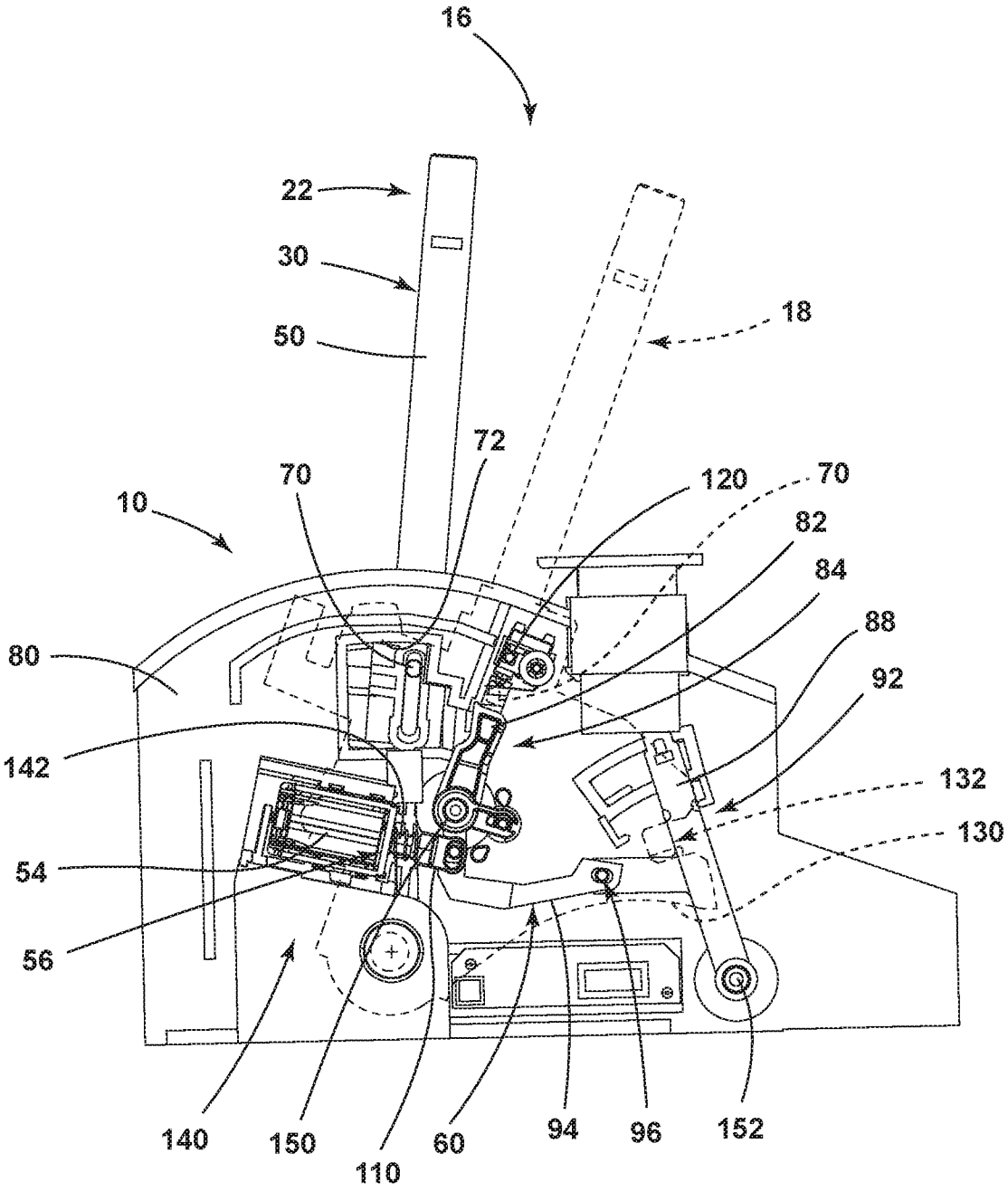
16
22
30
50
18
72
70
120
70
10
82
84
88
80
92
142
132
130
54
56
140
150
110
60
94
96
152

FIG. 4

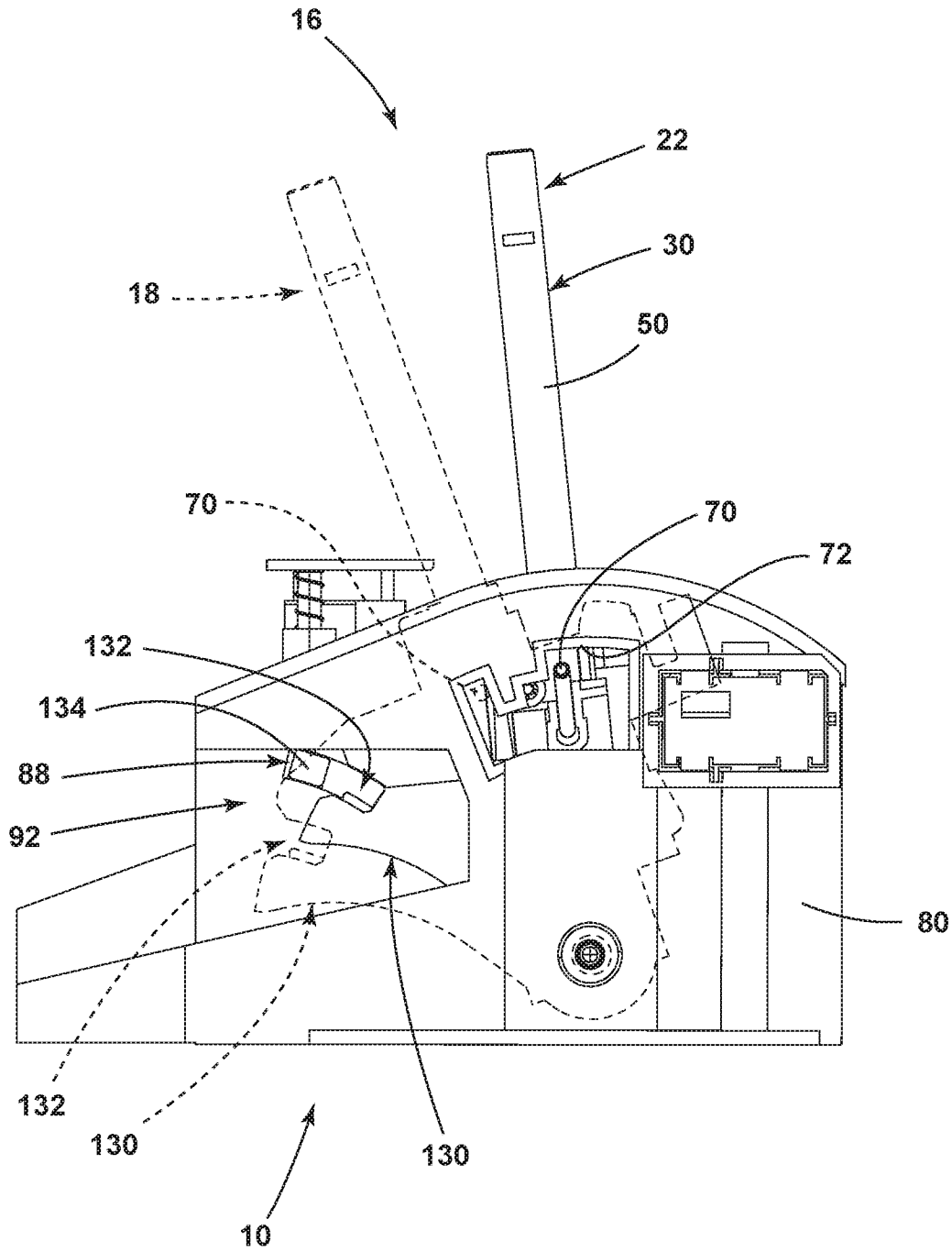

FIG. 5

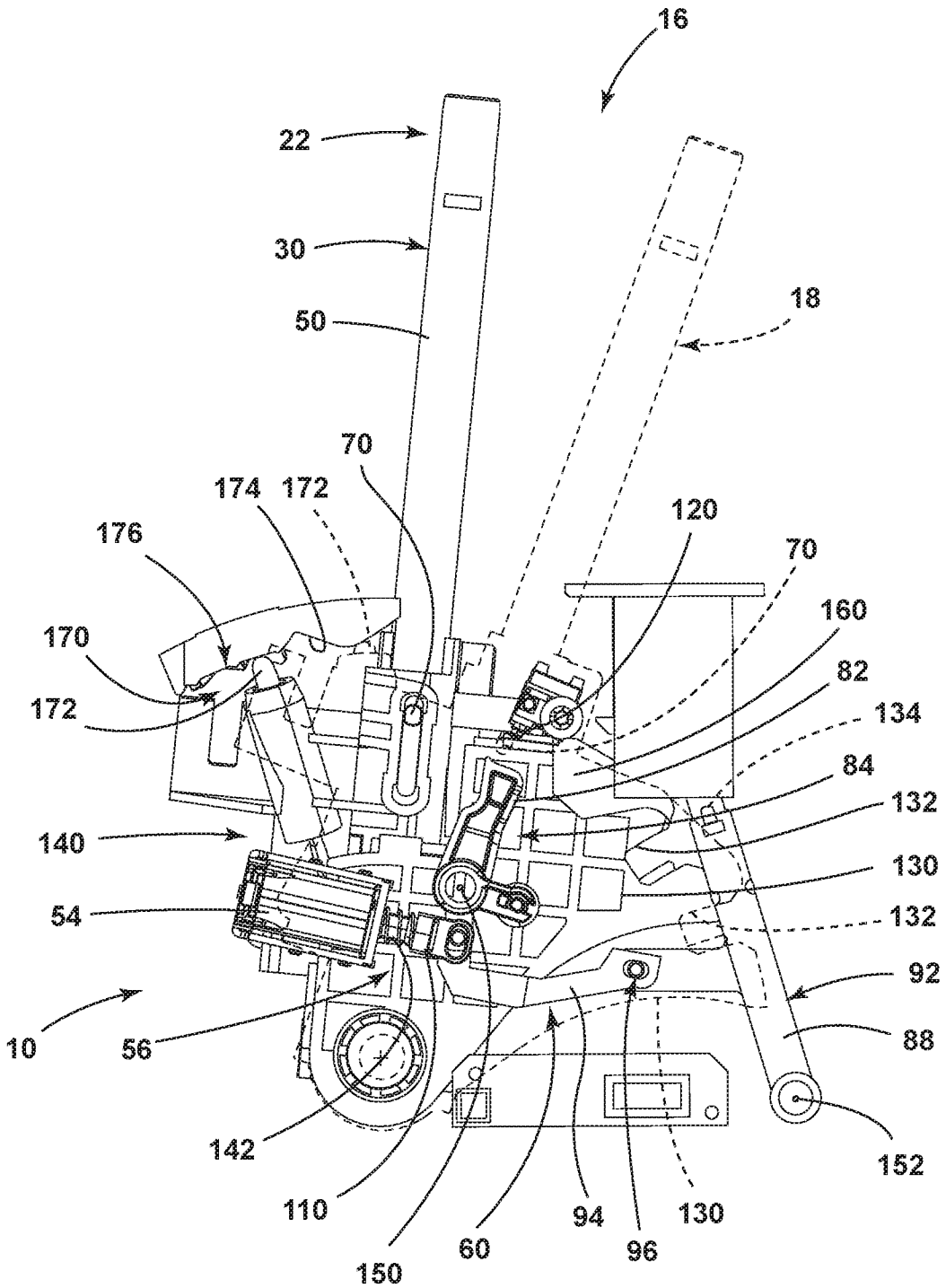
16
22
30
50
18
70
174
172
176
120
70
160
170
82
172
134
84
132
140
130
54
132
92
10
56
88
142
152
110
94
130
60
96
150

FIG. 6

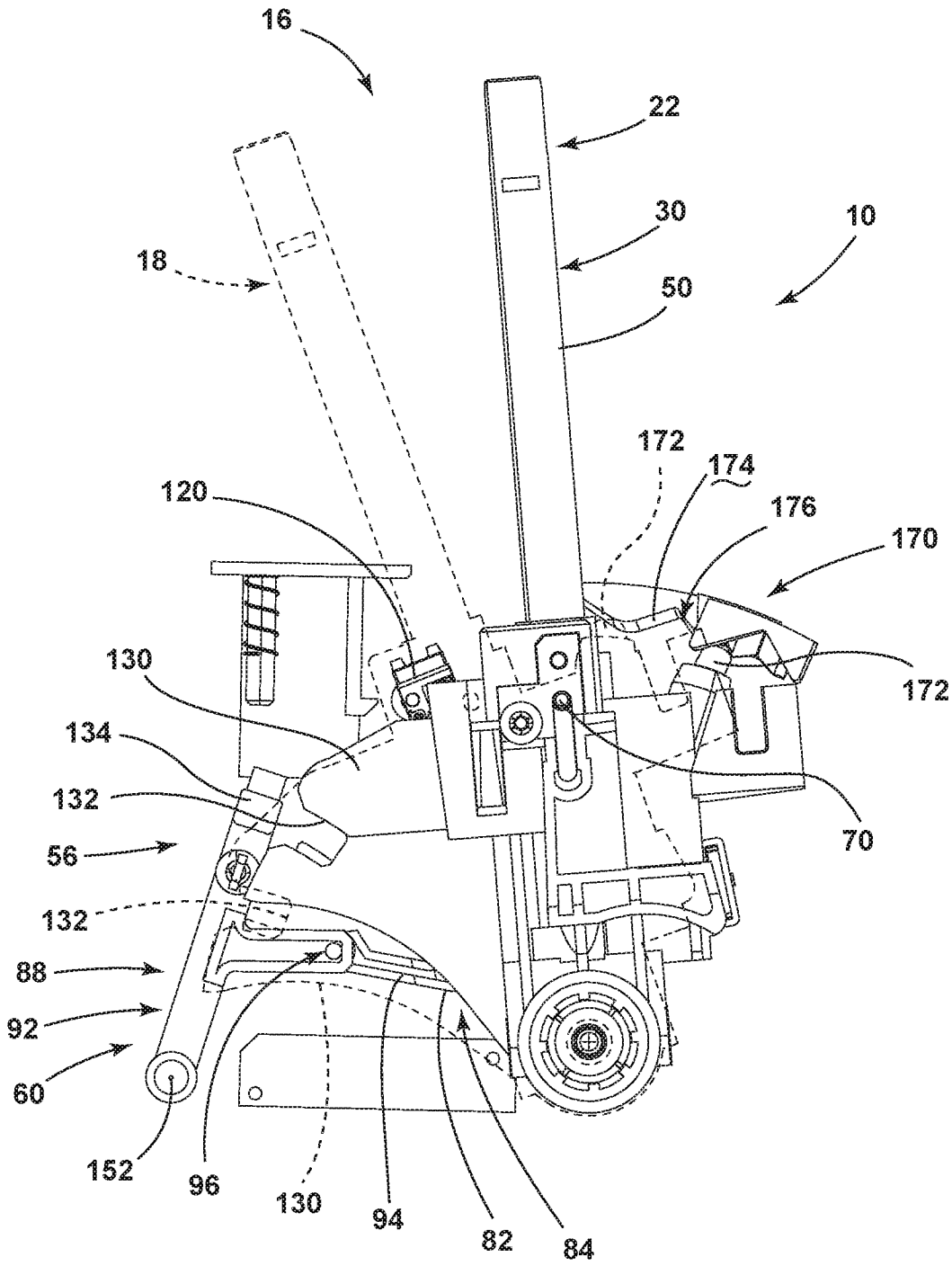
16
22
30
10
18
50
172
174
120
176
170
130
172
134
132
70
56
132
88
92
60
152
96
130
94
82
84

FIG. 7

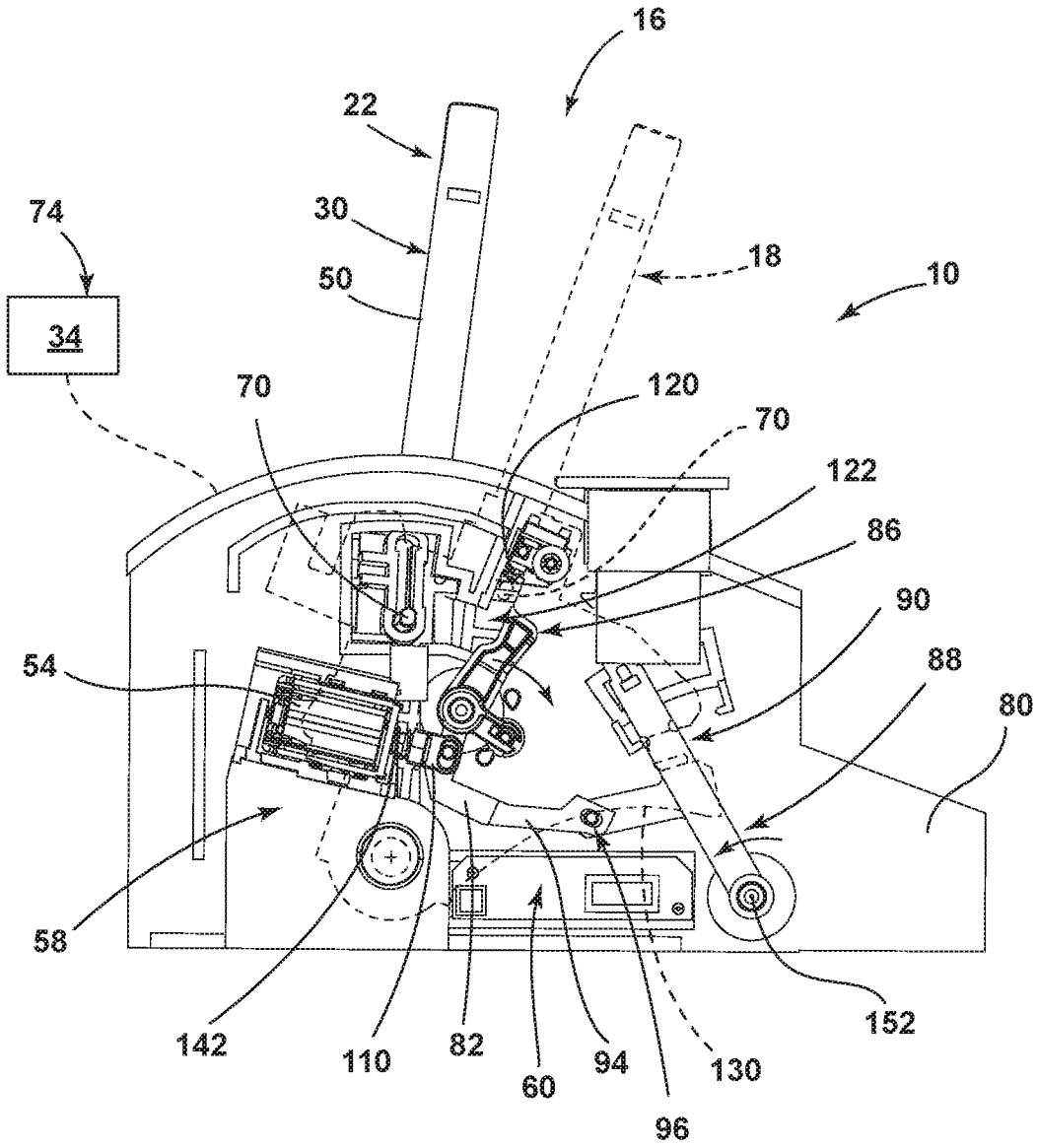
16
22
74
30
18
10
50
34
70
120
70
122
86
90
54
88
80
58
142
110
82
60
94
130
96
152

FIG. 8

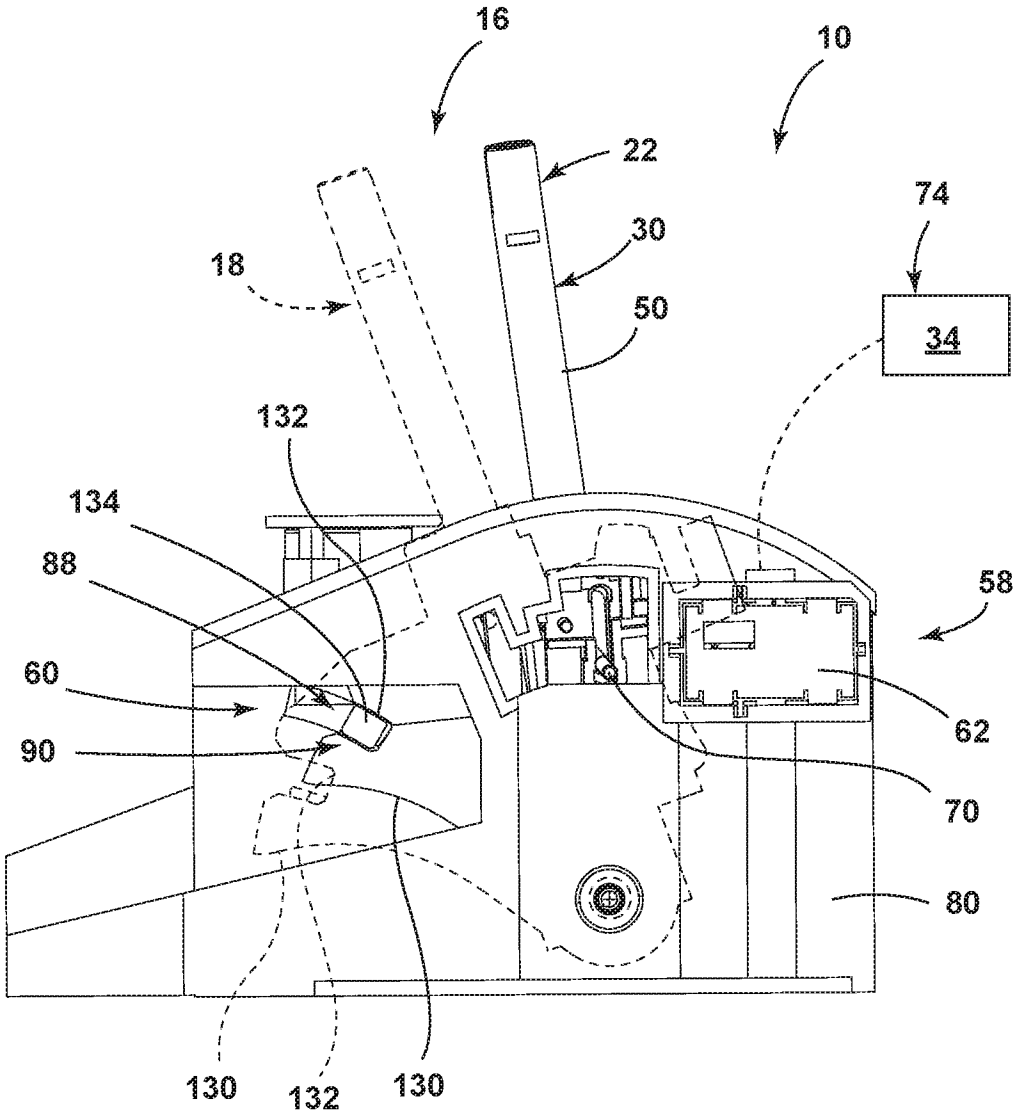

FIG. 9

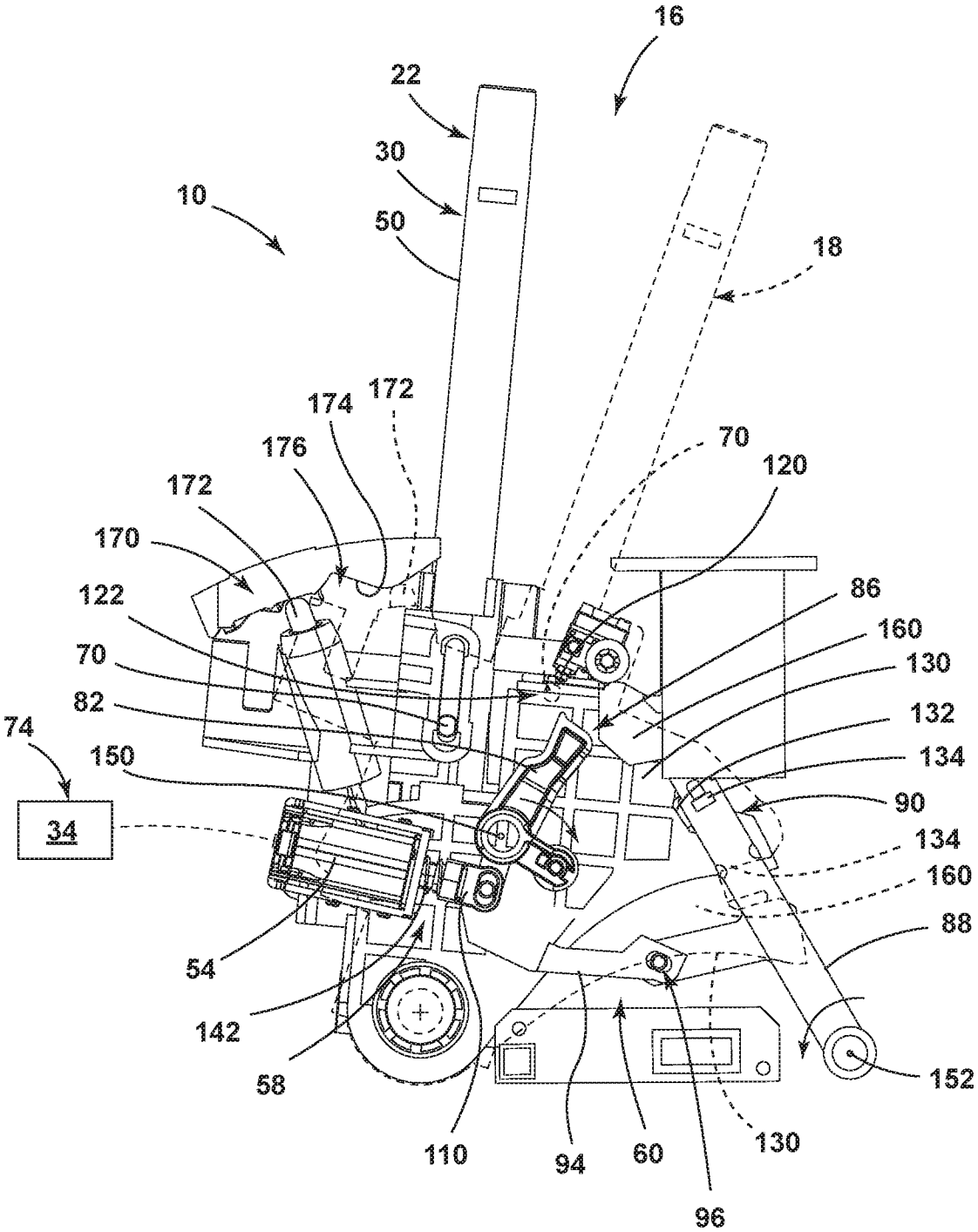
16
22
30
10
50
18
174
172
176
70
120
172
170
86
122
160
70
130
82
132
74
150
134
90
34
134
160
88
54
142
58
152
110
94
60
130
96

FIG. 10

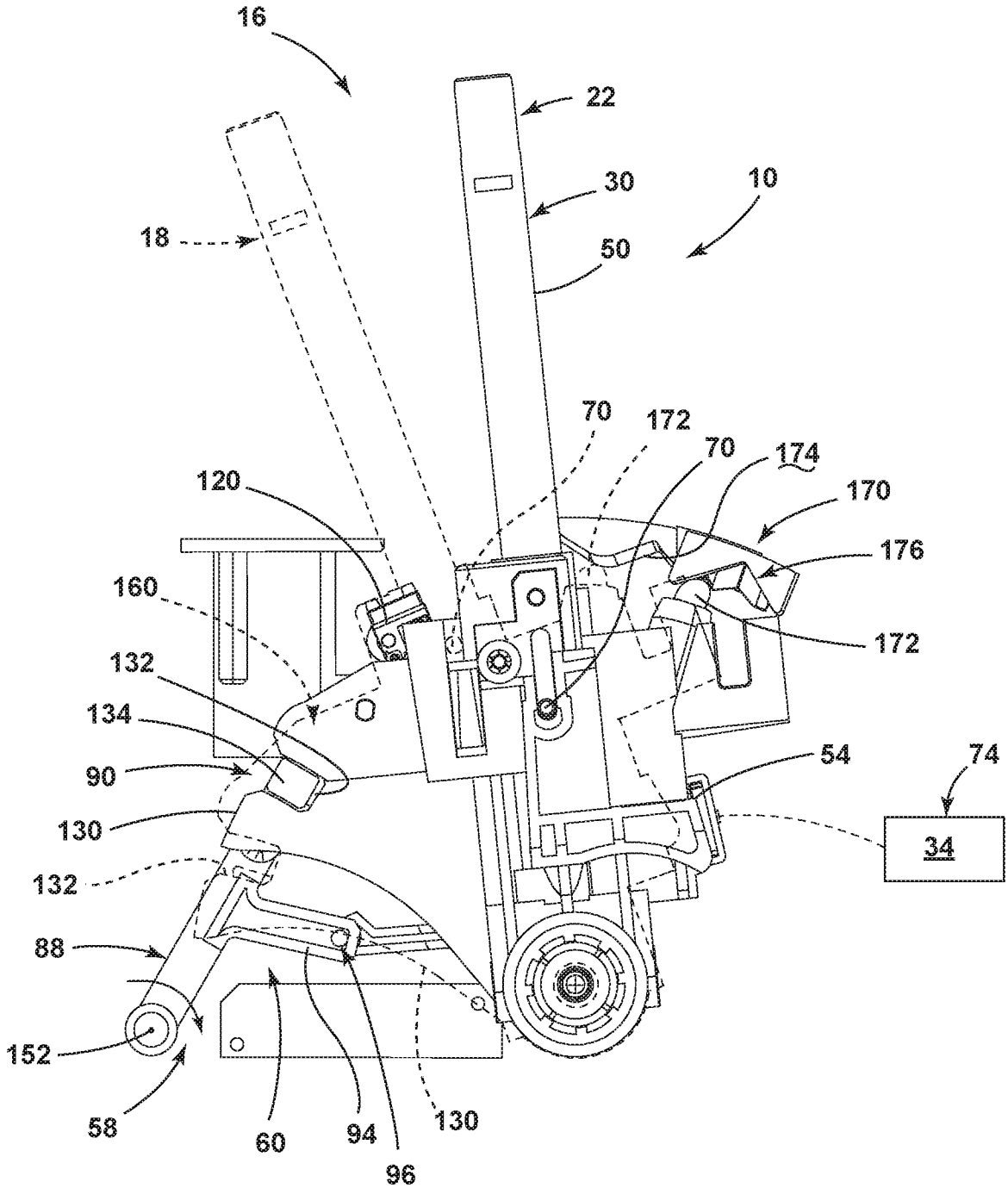
16
22
30
10
18
50
70
172
70
174
170
120
176
160
172
132
134
90
54
74
130
34
132
88
152
58
60
94
96
130

FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/101673

A. CLASSIFICATION OF SUBJECT MATTER

F16H61/22(2006.01)i;F16H59/10(2006.01)i

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)

F16H

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)

CNTXT,CNABS,CNKI,ENTXT: solenoid, lock, select, position, park, neutral, shift

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2017335957 A1 (DURA OPERATING LLC) 23 November 2017 (2017-11-23) Pages 1-3 and Fig.1-4	1-11
A	US 3942614 A (THOMPSON OWEN L) 09 March 1976 (1976-03-09) See the whole document	1-48
A	US 2018245690 A1 (HYUNDAI MOTOR CO LTD) 30 August 2018 (2018-08-30) See the whole document	1-48
A	US 2019219164 A1 (FCA ITALY SPA) 18 July 2019 (2019-07-18) See the whole document	1-48
A	US 2020309261 A1 (GM GLOBAL TECH OPERATIONS LLC) 01 October 2020 (2020-10-01) See the whole document	1-48

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"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	Date of mailing of the international search report
15 February 2023	**26 February 2023**

Name and mailing address of the ISA/CN	Authorized officer
CHINA NATIONAL INTELLECTUAL PROPERTY ADMINISTRATION **6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088, China**	**ZHANG,ShaoJing**
Facsimile No. **(86-10)62019451**	Telephone No. **(+86) 010-62085081**

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/101673

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
US 2017335957 A1	23 November 2017	EP 3246600 A1	22 November 2017
US 3942614 A	09 March 1976	None	
US 2018245690 A1	30 August 2018	KR 20180098457 A	04 September 2018
		KR 102412104 B1	23 June 2022
		US 10663060 B2	26 May 2020
US 2019219164 A1	18 July 2019	US 10830346 B2	10 November 2020
		EP 3511597 A1	17 July 2019
		EP 3511597 B1	26 February 2020
US 2020309261 A1	01 October 2020	DE 102020105616 A1	01 October 2020
		US 11326690 B2	10 May 2022