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(54) Title: SENSING AND CONTROL OF ACCESS CONTROL DEVICES

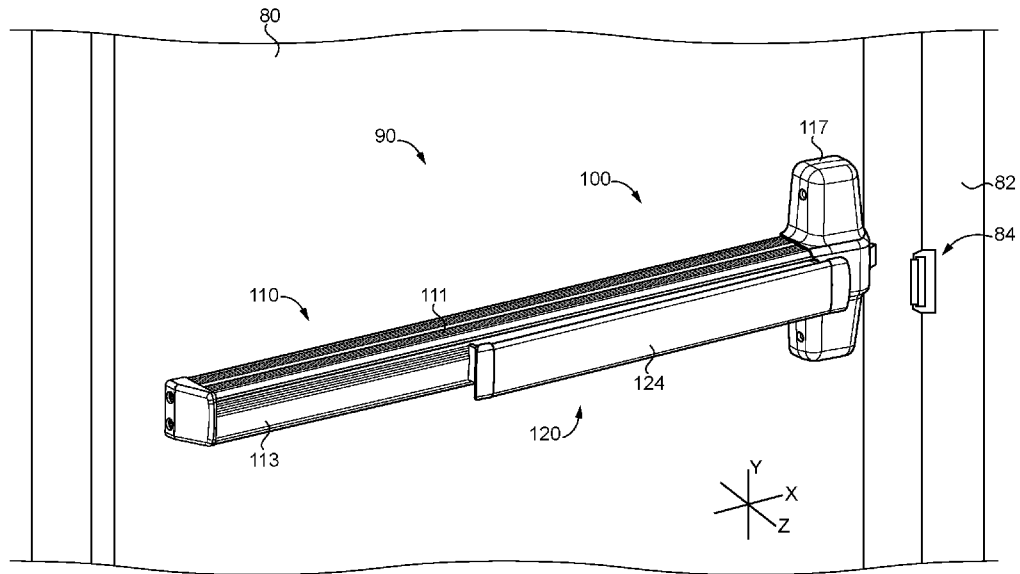


FIG. 1

(57) Abstract: An exemplary method generally relates to operating an access control device including a motor, a locking member, and a target component operably connected with the locking member. The motor may be operated to drive the locking member in a first direction from an initial position toward a desired position. When the locking member is blocked from moving beyond a blockage position, a target location of the target component is detected. The motor may then be operated to drive the locking member in a second direction opposite the first direction. The motor may then be operated to drive the locking member in the first direction toward the blockage position while monitoring the location of the target component. As the target component reaches the target location, the motor is supplied with a boost current to drive the locking member beyond the blockage position and toward the desired position.



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## INTERNATIONAL SEARCH REPORT

International application No.

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## A. CLASSIFICATION OF SUBJECT MATTER

IPC - E05B 47/02; E05B 65/10; E05B 17/22 (2020.01)

CPC - E05B 47/026; E05B 65/10; E05B 17/22

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)

See Search History document

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

See Search History document

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

See Search History document

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 19710834 A1 (EAK ELECTRONIC ALARM KROMER GM) 06 November 1997; see machine translation	1-8
Y	WO 2004/020769 A1 (MICRO LOCKS PTY LTD) 11 March 2004; see machine translation	1-8
Y	US 2008/0048600 A1 (DEJOHN CHARLES R) 28 February 2008; abstract; paragraph [0003]	3
Y	US 4,189,712 A (LEMELSON JEROME H) 19 February 1980; column 1, lines 55-65; column 3, line 60-column 4, line 10	4

 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

"&amp;" document member of the same patent family

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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US20/45196

## Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:  
-\*\*\*-Please See Supplemental Page-\*\*\*-

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:  
Group I: Claims 1-8

### Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

-\*\*\*-Continued From Box No. III: Observations where unity of invention is lacking-\*\*\*-

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-8 are directed toward: a method of operating an access control device including a driven assembly and an electromechanical actuator operably connected with the driven assembly, wherein the driven assembly has a first state and a second state, wherein one of the first state or the second state corresponds to a locked state of the access control device, and wherein the other of the first state or the second state corresponds to an unlocked state of the access control device, the method comprising: detecting a blockage of the driven assembly.

Group II: Claims 9-16 are directed toward: a method of operating an access control device, the method comprising: generating, by a sensor of the access control device, a position signal indicative of a location of the target component.

Group III: Claims 17-20 are directed toward: a method of operating an access control device, the method comprising: and while operating the motor to drive the locking member in the first direction toward the blockage position: monitoring the location of the target component.

The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical features of Group I include: a method of operating an access control device including a driven assembly and an electromechanical actuator operably connected with the driven assembly, wherein the driven assembly has a first state and a second state, wherein one of the first state or the second state corresponds to a locked state of the access control device, and wherein the other of the first state or the second state corresponds to an unlocked state of the access control device, the method comprising: detecting a blockage of the driven assembly; in response to detecting the blockage of the driven assembly, operating the electromechanical actuator in a second manner, which are not present in Groups II-III.

The special technical features of Group II include: a method of operating an access control device, the method comprising: generating, by a sensor of the access control device, a position signal indicative of a location of the target component when the locking member is in the blockage position, which are not present in Groups I and III.

The special technical features of Group III include: a method of operating an access control device, the method comprising: and while operating the motor to drive the locking member in the first direction toward the blockage position: monitoring the location of the target component; and as the target component approaches the target location, supplying the motor with a boost current to drive the locking member beyond the blockage position and toward the desired position, which are not present in Groups I-II.

The common technical features of Groups I-III are: a method of operating an access control device including a driven assembly and an electromechanical actuator operably connected with the driven assembly and a target component, wherein the driven assembly has a first state and a second state, wherein one of the first state or the second state corresponds to a locked state of the access control device, and wherein the other of the first state or the second state corresponds to an unlocked state of the access control device, the method comprising: operating the electromechanical actuator in a first manner to drive the driven assembly from the first state toward the second state, wherein operating the electromechanical actuator in the first manner includes limiting a current drawn by the electromechanical actuator to a first threshold limit; detecting a blockage of the driven assembly, the blockage preventing the driven assembly from moving in the first direction beyond a blockage state located between the first state and the second state; in response to detecting the blockage of the driven assembly, operating the electromechanical actuator in a second manner to move the driven assembly in a second direction opposite the first direction, thereby causing the driven assembly to move from the blockage state toward the first state; and operating the electromechanical actuator in a third manner to drive the driven assembly in the first direction and toward the blockage state, wherein operating the electromechanical actuator in the third manner comprises providing the electromechanical actuator with an increased current greater than the first threshold limit, thereby increasing a force exerted on the driven assembly as the driven assembly approaches the blockage position; generating a position signal indicative of a location of the target component when the locking member is in the blockage position.

These common technical features are disclosed by DE 19710834 A1 (EAK) in view of WO 2004/020769 A1 (MICRO). EAK discloses a method of operating an access control device including a driven assembly and an electromechanical actuator operably connected with the driven assembly and a target component (locking device 10 (access control device) is closed and opened by a motor 26 (electromechanical actuator) moving the locking bolt 18 (driven assembly) made of plastic material and embedded with a magnetic material (a target component); page 5, paragraph 9; page 7, paragraph 2; page 8, paragraph 7), wherein the driven assembly has a first state and a second state (bolt 18 moves between open position (second state) and closed position (first state); page 8; paragraph 9; page 9, paragraph 5), wherein one of the first state or the second state corresponds to a locked state of the access control device (bolt 18 moves between open position and closed position, i.e. locked state; page 8; paragraph 9; page 9, paragraph 5), and wherein the other of the first state or the second state corresponds to an unlocked state of the access control device (bolt 18 moves between open position, unlocked state, and closed position; page 8; paragraph 9; page 9, paragraph 5), the method comprising: operating the electromechanical actuator in a first manner to drive the driven assembly from the first state toward the second state (motor 26 is operated to move the bolt 18 from the closed position to the open position in a slow-speed operating state requiring lower operating voltage; page 8; paragraph 9), wherein operating the electromechanical actuator in the first manner includes limiting a current drawn by the electromechanical actuator to a first threshold limit (motor 26 is operated to move the bolt 18 from the closed position to the open position in a slow-speed operating state (limiting a current drawn) requiring lower operating voltage (first threshold limit); page 8; paragraph 9); the blockage preventing the driven assembly from moving in the first direction beyond a blockage state located between the first state and the second state (jammed intermediate position of the bolt 18 stops the bolt from fully moving from the closed position towards (first direction) the open position; page 5, paragraph 3; page 8, paragraph 3; page 9, paragraphs 1-4); and operating the electromechanical actuator in a third manner to drive the driven assembly in the first direction and toward the blockage state (motor 26 is operated to move the bolt 18 from the closed position towards the open position, thereby inherently towards the jammed intermediate position, with an increased operating voltage (third manner); page 8; paragraph 9; page 9, paragraphs 1-4), wherein operating the electromechanical actuator in the third manner

-\*\*\*-Continued Within the Next Supplemental Box-\*\*\*-

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comprises providing the electromechanical actuator with an increased current greater than the first threshold limit (motor 26 is operated to move the bolt 18 from the closed position towards the open position, thereby inherently towards the jammed intermediate position, with an increased operating voltage compared to the lower operating voltage; page 8; paragraph 9; page 9, paragraphs 1-4), thereby increasing a force exerted on the driven assembly as the driven assembly approaches the blockage position (motor 26 is operated to move the bolt 18 from the closed position towards the open position, thereby inherently towards the jammed intermediate position, with an increased operating voltage to provide a higher torque (increasing a force exerted); page 8; paragraph 9; page 9, paragraphs 1-4); generating a position signal indicative of a location of the target component when the locking member is in the blockage position (location of the magnetic material is detected by the magnetic field sensor 74 to provide the jammed bolt 18 location; page 8; paragraphs 3, 9; page 9, paragraphs 1-4). EAK does not disclose operating the electromechanical actuator in a second manner to move the driven assembly in a second direction opposite the first direction, thereby causing the driven assembly to move from the blockage state toward the first state. Micro operating the electromechanical actuator in a second manner to move the driven assembly in a second direction opposite the first direction, thereby causing the driven assembly to move from the blockage state toward the first state (upon detecting jamming of the latch 320 the direction of the motor (electromechanical actuator) is reversed (second manner) causing the latch 320 to move from the jammed partially open position towards the closed position (first state); page 20, paragraph 9). In order to improve the reliability of the operation of the access control device (EAK; page 4, description-paragraph 4), it would have been obvious to one of ordinary skill in the art to modify EAK's method to incorporate Micro's operating the electromechanical actuator in a second manner to move the driven assembly in a second direction opposite the first direction, because as Micro discloses the operating the electromechanical actuator in a second manner to move the driven assembly in a second direction opposite the first direction provides a more simple and reliable mechanism of operation (Micro; page 21, paragraph 5).

Since the common technical features are previously disclosed by EAK in view of Micro, the common features are not special and so Groups I-III lack unity.