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AUTOMATIC DOOR DRIVE AND ASSOCIATED OPERATING METHOD

The invention relates to an automatic door driver of the type described in the preamble of claim 1 and to an operating method for such an automatic door driver as described in the preamble of claim 10.

Automatic door drivers are known from the prior art, which in automatic operation move the door from a closed position into an open position and automatically close the door after elapse of a preset holding-open time. In addition, if the door should remain in the open position, the user must switch the operating mode into a permanently open mode and afterwards switch back again. This is particularly cumbersome if the program switch is difficult to access, which is often the case.

From DE 44 42 948 A1, a device is known for controlling moving units, which comprises an incremental transmitter designed as a potentiometer, in order to determine the current position of an overhead door. US-3874117 discloses an automatic door driver having the features of the preamble of claim 1. After a predefined holding-open period, the door is automatically closed again and, in the holding-open state, an operating mode is used with low-voltage holding action. In the door driver device according to DE-102011078832, a manual holding of the door by the user is evaluated as a locking request by the control device and it correspondingly controls the driver device to lock the door in the held position.

The problem addressed by the invention is that of providing an automatic door driver and an associated operating method which enable a simple and fast switching between two different operating modes.

This problem is solved through the features of the automatic door driver according to claim 1 and the features of the operating method for an automatic door driver according to claim 13.

Advantageous embodiments and further developments of the invention are disclosed in the other claims.

The automatic door driver according to the invention has a drive unit comprising a position transmitter, the output signals of which are evaluated by an evaluation and control unit in order to determine a current position of a door leaf. The evaluation and control unit activates a second operating mode, in which the door leaf is permanently held in an open position when, in the open position, the evaluation and control unit detects that the door leaf is moved further manually in the opening direction. In a first operating mode, the evaluation and control unit automatically closes the door leaf again, after a predefined holding-open period. This advantageously allows a simple switching from the first

operating mode into the second operating mode.

The operating method according to the invention for an automatic door driver evaluates output signals of a position transmitter in order to determine a current position of the door leaf and activates the second operating mode, in which the door leaf is permanently held in an open position when, in the open position, it is detected that the door leaf is moved further manually in the opening direction. In the first operating mode, the door leaf is automatically closed again after a predefined holding-open period.

The position transmitter can, for example, be designed as an incremental transmitter or a proximity sensor.

Embodiments of the automatic door driver according to the invention can be advantageously used for a door leaf designed as a pivoting leaf. For such a door leaf designed as a pivoting leaf, the individual increments of the incremental transmitter can correspond to a predefinable angle value. In this case, the closed position of the door leaf can be assigned a first value, which represents an angle of the door leaf in the closed state. The open position of the door leaf can be assigned a second value, which represents an angle of the door leaf in the open state. The evaluation and control unit then knows after how many increments the door leaf has reached its open position. If the user pushes the door leaf manually over this open position, the evaluation and control unit switches the operating mode to the second operating mode, in which the door leaf is held permanently in the open position.

A position transmitter designed as a proximity sensor can detect the distance of the door leaf from a stop. The proximity sensor can be arranged on the door leaf or on the stop. The proximity sensor can be designed as an ultrasound or infrared sensor or as a push-button or switch.

In a preferred embodiment of the automatic door driver according to the invention, the evaluation and control unit can detect the manual movement in the opening direction, from the fact that the value of the output signal from the proximity sensor increases. Alternatively, the evaluation and control unit can detect the manual movement in the opening direction from the fact that the output signal from the proximity sensor represents a decreasing distance.

In a preferred embodiment of the automatic door driver according to the invention, the evaluation and control unit can activate the first operating mode and close the door leaf again when, in the open position, the evaluation and control unit detects that the door leaf is moved manually in the closing direction. Through this feature, the door leaf can be closed both in the first operating mode as well as in the second operating mode, and be

moved from the open position into the closed position, when a manual actuation is detected in the closing direction.

Alternatively, the evaluation and control unit can activate the first operating mode and close the door leaf when, during the second operating mode, the evaluation and control unit detects, in the open position, that the door leaf is moved manually in the closing direction. Through this feature, the door leaf can only be closed in the second operating mode, and be moved from the open position into the closed position when a manual actuation is detected in the closing direction.

In a further advantageous embodiment of the automatic door driver according to the invention, the evaluation and control unit can detect the manual movement in the closing direction, from the fact that the value of the output signal from the proximity sensor decreases. Alternatively, the evaluation and control unit detects the manual movement in the closing direction from the fact that the output signal from the proximity sensor represents an increasing distance.

In a further advantageous embodiment of the automatic door driver according to the invention, the evaluation and control unit can close the open door leaf again in the second operating mode after a predefined safety period, which is longer than the holding-open period. As a result, it can be advantageously ensured that the door leaf is not inadvertently open.

In a further advantageous embodiment of the automatic door driver according to the invention, a resilient opening limiter can predefine the open position of the door leaf, in order to prevent an undesired change of the operating mode, for example through the influence of the wind.

An exemplary embodiment of the invention is explained in more detail below with reference to drawings.

The drawings show:

figure 1 a schematic block diagram of an exemplary embodiment of an automatic door drive according to the invention; and

figure 2 and 3 a schematic flow chart, which is followed by an evaluation and control unit of the automatic door driver according to the invention from figure 1.

As can be seen from figure 1, the automatic door driver 1 in the illustrated exemplary embodiment, comprises a drive unit 20 and an evaluation and control unit 10, which automatically opens and closes a door leaf 3 by means of the drive unit 20. In a first operating mode BA, the evaluation and control unit 10 automatically closes the door leaf 3 again after elapse of a predefined holding-open period and moves the door leaf 3 from

the open position into the closed position. In a second operating mode BD, the evaluation and control unit 10 holds the door leaf 3 permanently in the open position. According to the invention, the drive unit 20 has a position transmitter 22, the output signals from which are evaluated by the evaluation and control unit 10 to determine a current position of the door leaf 3, wherein the evaluation and control unit 10 activates the second operating mode BD when the evaluation and control unit 10 detects, in the open position, that the door leaf 3 is moved further manually in the opening direction.

The position transmitter 22 can for example be designed as an incremental transmitter or a proximity sensor.

In the illustrated exemplary embodiment, the door leaf 3 is designed as a pivoting leaf and the position transmitter 22 as an incremental transmitter. The individual increments of the incremental transmitter each correspond to a predefined angle value. Thus, the closed position of the door leaf 3 corresponds, for example, to a first value and the open position of the door leaf corresponds to a second value. If the door leaf 3 now moves in opening direction from the closed position into the open position, then the current value of the incremental transmitter 22 increases. If the door leaf 3 moves in closing direction from the open position into the closed position, then the current value of the incremental transmitter 22 decreases. The evaluation and control unit knows after how many increments the door leaf has reached its open position. If the user pushes the door leaf 3 manually over this open position, then the evaluation and control unit detects the corresponding increase in the current value of the incremental transmitter 22 above the second value, and switches the operating mode of the automatic door driver 1 into the second operating mode BD, in which the door leaf 3 is held permanently in the open position.

In the illustrated exemplary embodiment, the evaluation and control unit 10 activates the first operating mode 14 and closes the door leaf 3 when, during the second operating mode 14, the evaluation and control unit 10 detects, in the open position, that the door leaf 3 is moved manually in the closing direction. Alternatively, the evaluation and control unit 10 can be designed such that, independent of the current operating mode, the first operating mode BA activates and the door leaf is closed when the evaluation and control unit 10 detects, in the open position, that the door leaf 3 is moved manually in the closing direction.

In addition, in the illustrated exemplary embodiment, a safety period of for example approximately 2 minutes is predefined, which is longer than the holding-open period. This means that the evaluation and control unit 10 closes the open door leaf 3 again in the

second operating mode 14 at the end of the safety period, in order to ensure that the door leaf 3 is not inadvertently open.

In order to avoid an unintended switching of the operating mode, for example under the influence of the wind, a resilient opening limiter can be used, which predefines the open position of the door leaf 3.

As can be seen from figures 2 and 3, in the closed position Z1 of the door leaf 2, in step S100, the drive device 20 receives an opening signal from the evaluation and control unit 10. As a result, in step S110, the drive device 20 opens the door leaf 3 and moves the door leaf 3 from the closed position Z1 towards the open position Z2. In step S120, the evaluation and control unit 10 monitors the opening movement and compares the current door angle with the predefined angle in the open position Z2. If the door leaf 3 reaches the open position Z2 then, in step S200, the evaluation and control unit 10 starts a stop watch in order to detect when the holding-open period has elapsed. To this end, the evaluation and control unit 10 continuously compares the elapsed Time of the stopwatch with the value of the holding-open period. In addition, the evaluation and control unit 10 continuously checks the current door angle, in order to detect whether the door leaf 3 is moved. If, in step S210, the evaluation and control unit 10 detects that the current value of the incremental transmitter 22 representing the current door angle is greater than the second value representing the open position, then the evaluation and control unit 10 jumps to step S300. If the evaluation and control unit 10 detects no movement of the door leaf 3 then, in step S220, the evaluation and control unit 10 checks whether the holding-open period has elapsed. If the holding-open time has elapsed, then the evaluation and control unit 10 actuates the drive device 20, which closes the door leaf 3 in step S230 until it reaches the closed position Z1 and the automatic opening and closing procedure of the door leaf 3 triggered by the opening signal is completed.

In step S300, the evaluation and control unit 10 switches the operating mode from the first operating mode DA “Automatic” into the second operating mode BD “Permanently Open” and, in step S310, starts the stopwatch in order to detect when the safety period is lapsed. To this end, the evaluation and control unit 10 continuously compares the elapsed time of the stopwatch with the value of the safety period of approximately 2 minutes. In addition, the evaluation and control unit 10 continuously checks the current door angle, in order to detect whether the door leaf 3 is moved. If, in step S320, the evaluation and control unit 10 detects that the current value of the incremental transmitter 22 representing the current door angle is less than the second value representing the open position, then the evaluation and control unit 10 jumps to step S360. If the evaluation

and control unit 10 detects no movement of the door leaf 3 then, in step S330, the evaluation and control unit 10 checks whether the safety period has elapsed. If the safety period has elapsed, then, in step S340, the evaluation and control unit 10 switches the operating mode from the second operating mode BD “Permanently Open” into the first operating mode DA “Automatic”. In addition, the evaluation and control unit 10 checks the current door angle, in order to detect whether the door leaf 3 is moved again. If, in step S350, the evaluation and control unit 10 detects that the current value of the incremental transmitter 22 representing the current door angle is greater than the second value representing the open position, then the evaluation and control unit 10 jumps to step S300 and repeats steps S300 to S340. If, in step S350, the evaluation and control unit 10 has detected no movement of the door leaf 3, then the evaluation and control unit 10 jumps to S230 and actuates the drive device 20, which closes the door leaf 3 in step S230 until it reaches the closed position Z1.

In step S360, the evaluation and control unit 10 switches the operating mode from the second operating mode BD “Permanently Open” into the first operating mode DA “Automatic”. Then, the evaluation and control unit 10 jumps to step S230 and actuates the drive device 20, which closes the door leaf 3 in step S230 until reaching the closed position Z1.

In an alternative exemplary embodiment which is not shown, the position transmitter 22 is designed as a proximity sensor, which detects a distance of the door leaf 3 from a stop. The position transmitter 22 designed as a proximity sensor can be arranged on the door leaf 3 or on the stop. In contrast to the embodiment of the position transmitter 22 as an incremental transmitter, the closed position of the door leaf 3 is assigned to a first distance value, which represents an angle of the door leaf in the closed state. The open position of the door leaf 3 is assigned a second value, which represents an angle of the door leaf 3 in the open state. The evaluation and control unit 10 then knows when door leaf 3 approaches its open position and when the door leaf 3 moves away from the open position or has reached the open position. The proximity sensor can be designed, for example, as an ultrasound or infrared sensor. In the embodiment of the position transmitter 22 as a proximity sensor, the evaluation and control unit 10 detects the manual movement of the door leaf 3 in the opening direction through the fact that the output signal of the proximity sensor represents a decreasing distance. The manual movement of the door leaf 3 in the closing direction is detected by the evaluation and control unit 10 through the fact that the output signal of the proximity sensor represents an increasing distance. Thus, the evaluation and control unit 10 can carry out the above-described switching processes

between the different operating modes of the automatic door driver 1.

The automatic door driver according to the invention advantageously enables a door-angle-controlled operating mode switching function (“push and keep” function).

List of reference signs

1	Automatic door driver
3	Door leaf
10	Evaluation and control unit
BA	First operating mode “Automatic”
BD	Second operating mode “Permanently Open”
20	Drive device
22	Position transmitter
Z1	Door closed
Z2	Door open
S110 to S360	Method step

Automatisk dørdrev og tilhørende driftsmåde

Patentkrav

1. Automatisk dørdrev (1) med en drevenhed (20) og en evaluerings- og styreenhed (10), der automatisk åbner og lukker en dørfløj (3) ved hjælp af drevenheden (20), hvor evaluerings- og styreenheden (10) i en første driftsform (BA) automatisk igen lukker efter et forindstillet åbningstidsrum og bevæger dørfløjen (3) fra åben position til lukket position, og hvor evaluerings- og styreenheden (10) i en anden driftsform (BD) konstant holder dørfløjen (3) i åben positionen,
kendetegnet ved,
at drevenheden (20) har en stillingsmelder (22), hvis udgangssignaler evaluerings- og styreenheden (10) analyserer til bestemmelse af dørfløjens (3) aktuelle position, hvor evaluerings- og styreenheden (10) aktiverer den anden driftsform (BD), når evaluerings- og styreenheden (10) i den åbne position registrerer, at dørfløjen (3) manuelt bevæges videre i åbningsretningen.
2. Automatisk dørdrev ifølge krav 1,
kendetegnet ved,
at stillingsmelderen (22) er udført som inkrementgiver eller som nærhedssensor.
3. Automatisk dørdrev ifølge krav 2,
kendetegnet ved,
at evaluerings- og styreenheden (10) registrerer den manuelle bevægelse i åbningsretningen ved, at værdien af inkrementgiverens udgangssignal øges.
4. Automatisk dørdrev ifølge krav 2,
kendetegnet ved,
at evaluerings- og styreenheden (10) registrerer den manuelle bevægelse i åbningsretningen ved, at nærhedssensorens udgangssignal repræsenterer en afstand, der bliver mindre.
5. Automatisk dørdrev ifølge et af kravene 1 til 4,
kendetegnet ved,
at evaluerings- og styreenheden (10) aktiverer den første driftsform (BA) og lukker dørfløjen (3), når evaluerings- og styreenheden (10) i den åbne position registrerer, at dørfløjen (3) manuelt bevæges i lukkeretningen.
6. Automatisk dørdrev ifølge et af kravene 1 til 4,

kendetegnet ved,
at evaluerings- og styreenheden (10) aktiverer den første driftsform (BA) og lukker dørfløjen (3), når evaluerings- og styreenheden (10) under den anden driftsform (BD) i den åbne position registrerer, at dørfløjen (3) manuelt bevæges i lukkeretningen.

7. Automatisk dørdrev ifølge krav 5 eller 6,
kendetegnet ved,
at evaluerings- og styreenheden (10) registrerer den manuelle bevægelse i lukkeretningen ved, at inkrementgiverens udgangssignal aftager.

8. Automatisk dørdrev ifølge krav 5 eller 6,
kendetegnet ved,
at evaluerings- og styreenheden (10) registrerer den manuelle bevægelse i lukkeretningen ved, at nærhedssensorens udgangssignal repræsenterer en afstand, der bliver større.

9. Automatisk dørdrev ifølge et af kravene 1 til 8,
kendetegnet ved,
At evaluerings- og styreenheden (10) igen lukker den åbne dørfløj (3) i den anden driftsform (BD) efter et forindstillet sikkerhedstidsrum, der er længere end åbningstidsrummet.

10. Automatisk dørdrev ifølge et af kravene 1 til 9,
kendetegnet ved,
at en fjedrende åbningsbegrænser angiver dørfløjens (3) åbne position.

11. Automatisk dørdrev ifølge et af kravene 1 til 10,
kendetegnet ved,
at dørfløjen (3) er udført som svingdørsfløj.

12. Automatisk dørdrev ifølge krav 11,
kendetegnet ved,
at de enkelte inkrementer fra inkrementgiveren modsvarer en forindstilbar vinkelværdi.

13. Driftsmåde for et automatisk dørdrev (1), der automatisk åbner og lukker en dørfløj (3) ved hjælp af en drevenhed (20), hvor dørfløjen (3) i en første driftsform (BA) automatisk igen lukkes efter et forindstillet åbningstidsrum og bevæges fra en åben position til en lukket position, og hvor dørfløjen (3) i en anden driftsform (BD) konstant holdes i den åbne position, kendetegnet ved,
at en stillingsmelders (22) udgangssignaler analyseres til bestemmelse af en aktuel position af dørfløjen (3), og den anden driftsform (BD) aktiveres, når det i den åbne position

registreres, at dørfløjen (3) manuelt bevæges videre i åbningsretningen.

14. Fremgangsmåde ifølge krav 13,
kendetegnet ved,
at stillingsmelderen (22) udføres som inkrementgiver eller som nærhedssensor.

15. Fremgangsmåde ifølge krav 14,
kendetegnet ved,
at den manuelle bevægelse i åbningsretningen registreres ved, at værdien af inkrementgiverens udgangssignal øges, eller nærhedssensorens udgangssignal repræsenterer en afstand, der bliver mindre.

16. Fremgangsmåde ifølge et af kravene 13 til 15,
kendetegnet ved,
at den første driftsform (BA) aktiveres, og dørfløjen (3) lukkes, når en manuel bevægelse af dørfløjen (3) i lukkeretningen registreres i den åbne position.

17. Fremgangsmåde ifølge et af kravene 13 til 15,
kendetegnet ved,
at den første driftsform (BA) aktiveres, og dørfløjen (3) lukkes, når en manuel bevægelse af dørfløjen (3) i lukkeretningen registreres i den åbne position under den anden driftsform (BD).

18. Fremgangsmåde ifølge krav 16 eller 17,
kendetegnet ved,
at den manuelle bevægelse i lukkeretningen registreres ved, at værdien af inkrementgiverens (22) udgangssignal aftager, eller nærhedsfølerens udgangssignal repræsenterer en afstand, der bliver større.

19. Fremgangsmåde ifølge et af kravene 13 til 18,
kendetegnet ved,
at den åbne dørfløj (3) i den anden driftsform (BD) igen lukkes efter et forindstillet sikkerhedstidsrum, der er længere end åbningstidsrummet.

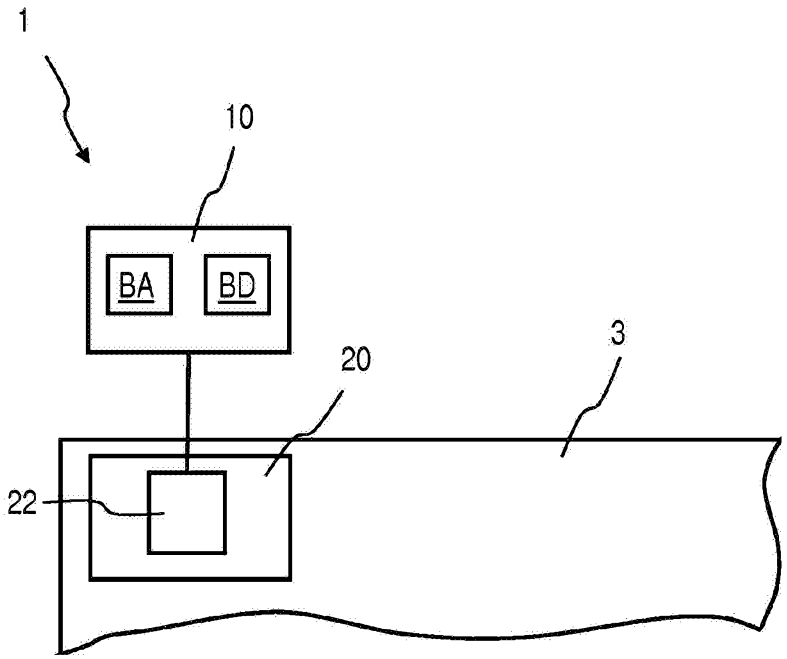

FIG. 1

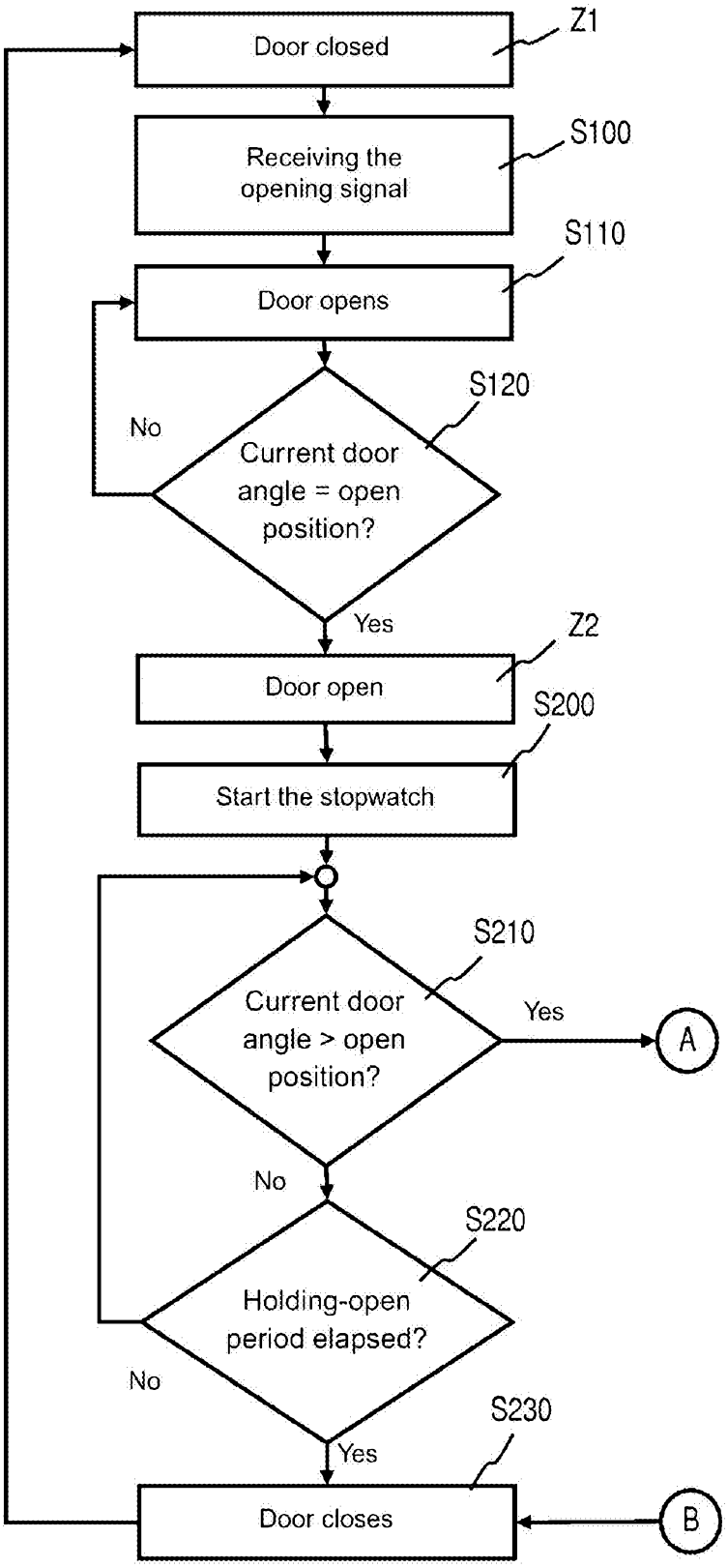
Door closed
Z1
Receiving the opening signal
S100
Door opens
S110
Current door angle = open position?
S120
No
Yes
Door open
Z2
Start the stopwatch
S200
Current door angle > open position?
S210
Yes
A
No
Holding-open period elapsed?
S220
No
Yes
Door closes
S230
B

FIG. 2

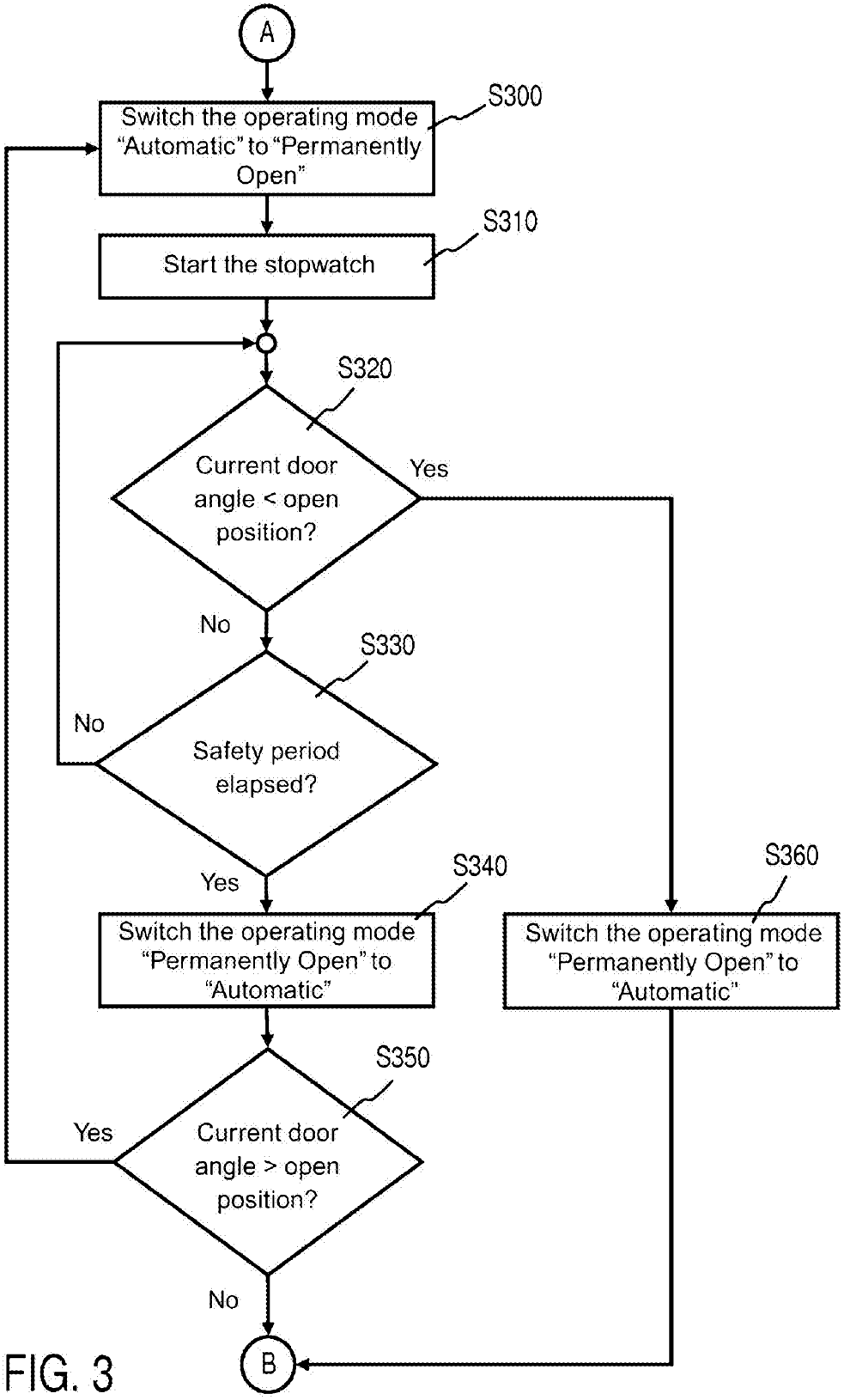
A
Switch the operating mode "Automatic" to "Permanently Open"
S300
Start the stopwatch
S310
S320
Current door angle < open position?
Yes
No
S330
Safety period elapsed?
No
Yes
S340
Switch the operating mode "Permanently Open" to "Automatic"
S360
Switch the operating mode "Permanently Open" to "Automatic"
S350
Current door angle > open position?
Yes
No
B

FIG. 3