

(19)



(11)

EP 4 497 905 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
29.01.2025 Bulletin 2025/05

(51) International Patent Classification (IPC):
E05F 15/641 ^(2015.01)

(21) Application number: **23187981.8**

(52) Cooperative Patent Classification (CPC):
E05F 15/641; E05F 15/73; E05Y 2201/688;
E05Y 2201/71; E05Y 2400/354; E05Y 2400/614;
E05Y 2400/66; E05Y 2600/46; E05Y 2900/132

(22) Date of filing: **27.07.2023**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(72) Inventors:
• **SELI NIK, Blaz**
3333 Ljubno ob Savinji (SI)
• **SELI NIK, Alojz**
3333 Ljubno ob Savinji (SI)
• **SELI NIK, Matija**
3333 Ljubno ob Savinji (SI)

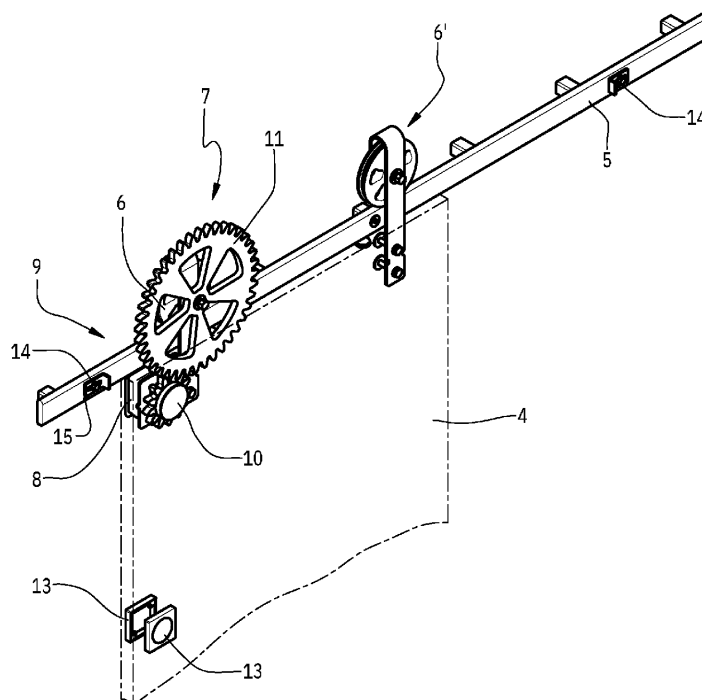
(71) Applicant: **Selisnik, Blaz**
3333 Ljubno ob Savinji (SI)

(74) Representative: **Ivancic, Bojan**
Inventio d.o.o.
Dolenjska cesta 11
1000 Ljubljana (SI)

(54) AUTOMATED DOOR SYSTEM

(57) The present invention refers to a door system, more specifically to an automated door system suitable for touch and/or non-touch operation. A door leaf (4) equipped with a moving device (7) is arranged on a guide (5) and can be moved between limiters (14; 14') of the door leaf (4) travel attached to the guide (5), wherein a magnetic means (15) is provided on the guide (5) and in

the area of at least one of the limiters (14; 14'). The said moving device (7) comprises a motor unit (8) connected to an energy source (8a) and a means (9) to transmit rotational motion from the motor unit (8) to at least one roller means (6; 6'). At least one touch means (13) to control the automated door system (1) is arranged on each flat side of the said door leaf (4).

**FIG. 2****EP 4 497 905 A1**

Description

[0001] The present invention refers to a door system, more specifically to an automated door system suitable for touch and/or non-touch operation.

[0002] The door system of the aforementioned type is known from the publication of the International Patent Application No. WO 2021255732 A1. Disclosed is a door system comprising a door frame and a door leaf connected by a hinge; a motor unit for the door leaf that is configured to move the door leaf between an open position and a closed position and that responds to a signal for opening the door leaf or closing the door leaf; and a single non-touch door module. The latter comprises a locking unit configured to move a locking latch between a locked position, in which it is engaged with a locking device and is responsive to a locking signal, and an unlocked position, in which it is responsive to an unlocked signal. A control unit comprises at least one internal sensor, at least one external sensor, a signalling system configured to emit a detectable door mode signal responsive to door leaf parameters, and a controller configured and operable to generate: an input signal responsive to a signal received from at least one external sensor for the motor unit to move the door leaf to the open position; a door leaf closing signal responsive to a signal received from at least one internal sensor for the motor unit to move the door leaf to the closed position and a corresponding busy signal; and an output signal responsive to a further signal received from at least one internal sensor for the motor unit to move the door leaf to the open position. The said at least one external sensor and at least one internal sensor are selected as non-touch sensors.

[0003] The object of the present invention is to create a new automated door system that remedies shortcomings of the known solution.

[0004] The object according to the present invention is achieved by characteristics set forth in the characterizing portion of claim 1. The details of the invention are disclosed in the corresponding sub-claims.

[0005] The invention is further described in detail by way of a non-limiting embodiment and with a reference to the accompanying drawings, where

Fig. 1 shows a wall-mounted door leaf with an automated door system according to the invention in a three-dimensional view,

Fig. 2 shows the automated door system in a three-dimensional view,

Fig. 3 shows the automated door system in a view from the guide side,

Fig. 4 shows a schematic control procedure of the automated door system.

[0006] The continuation of the description defines the

term **above**, which throughout the description expresses a vertical position that lies higher than a specific position in space, the term **below**, which throughout the description expresses a vertical position that lies lower than the said specific position in space, the term **left**, which throughout the entire description expresses a horizontal position that, when looking at a guide of an automated door system according to the invention, lies to the left of a specific position in space, and the term **right**, which throughout the description expresses a horizontal position that lies opposite the said left position.

[0007] The automated door system 1 according to the invention is, for example, shown in Fig. 1 as built into the area of a door opening 2 in a wall 3, wherein the said door opening 2 can be closed with a door leaf 4 movable along the said wall 3. The said door leaf 4 (shown by a dash-dotted line in Fig. 2) is preferably selected as a wooden door leaf, however there is no limitation that the door leaf 4 may not be made of another suitable material, such as glass, metal, or plastic.

[0008] The automated door system 1 comprises a guide 5 attached to the said wall 3 in the area above the said door opening 2 and the door leaf 4 arranged thereto. The door leaf 4 is arranged movably along the said wall 3 on the said guide 5, wherein the said movability is provided by means of at least one roller means, preferably by means of two roller means 6; 6' of a moving device 7 spaced from each other in the longitudinal direction of the guide 5 or fixed in the area of each upper longitudinal end of the door leaf 4, wherein the said roller means 6; 6' engage the said guide 5. The said engagement of the guide 5 and the roller means 6; 6' is selected as a force-locking and/or form-locking joint, for example a friction joint.

[0009] In the specific embodiment, the said moving device 7 comprises a motor unit 8 connected to an energy source 8a and means 9 to transmit rotational motion from the motor unit 8 to at least one of the roller means 6; 6'. In the presented embodiment, the said means 9 to transmit the rotational motion is selected as a mutually engaging pair of gear wheels 10; 11, wherein the first gear wheel 10 is represented by a pinion that is coupled to the motor unit 8, while the second gear wheel 11 is coupled to at least one of the said roller means 6; 6', preferably to a roller mean 6 arranged in proximity to the said means 9 for the transmission of rotational motion from the motor unit 8 to the roller means 6; 6'.

[0010] The said motor unit 8, which is connected to the said energy source 8a, is formed in a manner that it can be installed in a concealed manner in the door leaf 4 together with the said energy source 8a, wherein the energy source 8a is selected as a battery that can be charged remotely through a wireless connection, for example by using a portable charging device (power bank) 8b. The aforementioned provisions ensure that the wiring of the energy source for the motor unit 8 is completely redundant, making the automated door system 1 according to the invention work even in the ab-

sence of a power supply from the public power grid.

[0011] Furthermore, it is provided for according to the present invention that at least one handle 12 is arranged on each flat side of the said door leaf 4 for manually moving the door leaf 4 from an open position to a closed position and vice versa. In addition, at least one touch means 13 for controlling the automated door system 1 is arranged on each flat side of the said door leaf 4. The said touch means 13 can be selected as a simple touch sensor that enables only the opening and/or closing of the door leaf 4, or as a complex sensor that enables the entire control of the door system 1 from the first operation onwards. In this case, the said touch means 13 comprises at least one energy source 13a, at least one device 13b to receive or emit electromagnetic waves, and optionally a display 13c to display commands to control the automated door system 1. Obviously, the automated door system 1 can also be controlled in a different way, for example wirelessly by using a mobile device, a personal computer, etc.

[0012] In the presented embodiment, one touch means 13 is arranged on each flat side of the said door leaf 4 for the control of the automated door system 1. The said touch means 13 are connected to each other by wires or wirelessly and preferably powered by means of only one energy source 13a, for example by means of a button cell battery.

[0013] The automated door system 1 also works in case of danger, for example the trapping of a person or object passing through the door opening, fire, etc., as the door leaf 4 can also be moved manually. In case of non-operation of the motor unit 8, in the event of a malfunction, or when the said energy source can no longer provide energy to drive said motor unit 8, the said moving device 7 automatically places the door leaf 4 in the open position.

[0014] Limiters 14; 14' of the door leaf 4 movement are attached to the said guide 5 to the left and right of the moving device 7. The first limiter 14, viewed in the horizontal direction, is arranged in the area of the door opening 2, so that in the case of manual movement of the door leaf 4, the door leaf 4 rests against the said limiter 14 and the door opening 2 is completely closed, which simultaneously prevents any possible detachment of the moving device 7 from the guide 5. In the open position of the door leaf 4, the latter rests against the second limiter 14', which, when viewed in the horizontal direction, is spaced from the first limiter 14, and the door opening 2 is open. Furthermore, on or in the guide 5 in the area of the first limiter 14 and in the direction away from the door opening 2, a magnetic means 15 is arranged to additionally determine the first end position of the door leaf 4, in particular during the first operation of the automated door system 1.

[0015] In addition to the said energy source 8a, the said motor unit 8 also comprises: at least one sensor 8c, for example a thermal sensor, a motion sensor, a sensor to recognize the body or part of the body of a person who is supposed to pass through the open door opening 2, and a

sensor 8g intended to cooperate with the said magnetic means 15; a processing unit 8d that processes the data received from the touch means 13 to manage the automated door system 1; a memory unit 8e which either permanently or temporarily stores the data received from the processing unit 8d or from the touch means 13 for controlling the automated door system 1; a device 8f to receive or emit electromagnetic waves that is wirelessly connectable with at least one further device 13b to receive or emit electromagnetic waves of the said touch means 13 or with at least one further device to receive or emit electromagnetic waves of a mobile device, personal computer, etc.; and a drive 8h that is controlled by the processing unit 8d and creates a rotational motion to move the door leaf 4 to the open or closed position. The drive 8h is paired in advance with the processing unit 8d or an encoder 8i.

[0016] Furthermore, it is provided for according to the present invention, that at least the assembly of the automated door system 1 comprising the guide 5, the roller means 6; 6', the pair of gear wheels 10; 11, and optionally the said handle 12, is made of wood, metal, plastic, etc., but preferably of wood.

[0017] During the assembly and installation of the automated door system 1 according to the invention, appropriate or required cut-outs are made in the selected wood, metal, glass, or plastic door leaf 4 at the installation areas of the motor unit 8 and touch means 13. Guide 5 is attached to the wall 3 in the area above the door opening 2 with two limiters 14; 14' of the door leaf 4 travel and magnetic means 15. After that, the said moving device 7 is attached to the thus prepared door leaf 4 and placed on the said guide 5.

[0018] The automated door system 1 is thus ready for its first operation, after which the said portable charging device (power bank) 8b is installed to enable the calibration of the drive 8h with respect to the opening direction of the door leaf 4, the door leaf 4 travel in one and/or the other direction, and the mass of the door leaf 4. The said calibration of the drive 8h is initiated by the said touch means 13 or a mobile device or a computer.

[0019] The said processing unit 8d activates the drive 8h, which during the calibration step always moves the door leaf 4 in the first, left direction. When the door leaf 4 rests against the first limiter 14, the processing unit 8d determines the first end position of the door leaf 4, the opening direction of the door leaf 4, and the open position thereof. When the sensor 8g detects the magnetic means 15, the processing unit 8d determines the first end position of the door leaf 4 as well as the closed position. The parameters determined in this way are stored by the processing unit 8d in the memory unit 8e.

[0020] Then the processing unit 8d activates the drive 8h to start moving the door leaf 4 in the opposite direction, away from the first limiter 14 towards the second limiter 14', at the first, relatively low speed. When the door leaf 4 rests against the second limiter 14', the processing unit 8d determines the second end position of the door leaf 4,

the door leaf 4 travel distance, and the open position. The parameters determined in this way are stored by the processing unit 8d in the memory unit 8e.

[0021] The said processing unit 8d reactivates the drive 8h to start moving the door leaf 4 in the opposite direction at the second, relatively high speed, this time away from the second limiter 14' towards the first limiter 14. Depending on the current energy consumption, the processing unit 8d determines the mass of the door leaf 4. The parameters determined in this way are stored by the processing unit 8d in the memory unit 8e. The said second, relatively high movement speed of the door leaf 4 is significantly higher than the said first, relatively low movement speed of the door leaf 4.

[0022] When a person attempts to pass through the door opening 2 closed by the door leaf 4 and gets close enough to the door opening 2 to be detected by one of the said sensors 8c, the door leaf 4 can move from the closed position to the open position in several possible ways, depending on the type of the sensor 8c, the permission to pass through the door opening 2 stored in the memory unit 8e, etc. If the sensor 8c is selected as the motion sensor or the thermal sensor, the door leaf 4 moves to the open position when the sensor 8c detects the approach of a person or after a predetermined time and closes when the person who has passed the door opening 2 has disappeared from the detection area of the sensor 8c or after a predetermined time. The said predetermined time is stored in the memory unit 8e.

[0023] When the sensor 8c is selected as the sensor for recognising the body or part of the body of a person who is supposed to pass through the open door opening 2, the information about the said person is transferred from the sensor 8c to the processing unit 8d. The latter retrieves information about the said person from the memory unit 8e if the person was previously stored and, based on the stored information, sends a command to the drive 8h to move the door leaf 4 to the open position or leave it in the closed position.

[0024] The user can choose to turn off the said sensors and operate the door leaf 4 only with the touch means 13 or completely manually. When operating the door leaf 4 only with the touch means 13, the user touches the area or the display 13c and the door leaf 4 moves to the open position. After a predetermined time, the door leaf moves to the closed position.

Claims

1. An automated door system suitable for non-touch operation, comprising a movable door leaf provided to close a door opening, a door leaf motor unit configured to move the door leaf between an open position and a closed position and responsive to a signal for opening the door leaf or closing the door leaf, and a non-touch unit to control the motor unit, **characterized in that** a door leaf (4) provided with a

moving device (7) is arranged on a guide (5) and is movable between limiters (14; 14') of the door leaf (4) movement attached to the guide (5), wherein a magnetic means (15) is provided on the guide (5) and in the area of at least one of the limiters (14; 14'); the said moving device (7) comprises the motor unit (8) connected to an energy source (8a) and means (9) to transmit rotational motion from the motor unit (8) to at least one roller means (6; 6'); wherein at least one touch means (13) to control an automated door system (1) is arranged on each flat side of the said door leaf (4).

2. The automated door system according to claim 1, **characterized in that** the said mobility of the door leaf (4) is provided by means of two roller means (6; 6') of the moving device (7) that are spaced from each other in the longitudinal direction of the guide (5) and fixed to the door leaf (4), wherein the said roller means (6; 6') are in a joint with the said guide (5) and wherein the said joint of the guide (5) and roller means (6; 6') is selected as a force-locking and/or form-locking joint.

3. The automated door system according to one of the claims 1 and 2, **characterized in that** the said means (9) to transmit the rotational motion is selected as a mutually engaging pair of gear wheels (10; 11), wherein the first gear wheel (10) is coupled to the motor unit (8), while the second gear wheel (11) is coupled to at least one of the said roller means (6; 6').

4. The automated door system according to any of the preceding claims, **characterized in that** the said touch means (13) is selected as a simple touch sensor that only enables opening and/or closing the door leaf (4).

5. The automated door system according to claim 4, **characterized in that** the said touch means (13) is selected as a complex sensor that enables the entire control of the door system (1) from its first operation onwards.

6. The automated door system according to claims 4 or 5, **characterized in that** the said respective touch means (13) comprises at least one energy source (13a) and at least one device (13b) to receive or emit electromagnetic waves.

7. The automated door system according to claims 4 to 6, **characterized in that** the said respective touch means (13) comprises a display (13c).

8. The automated door system according to any of the preceding claims, **characterized in that** the said motor unit (8), which is coupled to the said energy

source (8a), is formed in such a way that it can be installed together with the said energy source (8a) in the door leaf (4) in a concealed manner, wherein the energy source (8a) is selected as a battery that can be charged remotely through a wireless connection, for example with the help of a portable charging device (power bank) (8b).

9. The automated door system according to any of the preceding claims, **characterized in that** the said motor unit (8) in addition to the said energy source (8a) comprises:

at least one sensor (8c), for example a thermal sensor, a motion sensor, a sensor for recognizing the body or part of the body of a person who is supposed to pass through the open door opening (2), and a sensor (8g) provided to cooperate with the said magnetic means (15);
a processing unit (8d) that processes the data received from the touch means (13);
a memory unit (8e) that stores data received from the processing unit (8d) or from the touch means (13);
a device (8f) to receive or emit electromagnetic waves that is wirelessly connectable to at least one further device (13b) to receive or emit the electromagnetic waves of the said touch means (13) or to at least one further device to receive or emit electromagnetic waves of a mobile device, personal computer, etc.; and
a drive (8h) that is controlled by the processing unit (8d) and that creates a rotational motion to move the door leaf (4) to the open or closed position, wherein
the drive (8h) is pre-paired with the processing unit (8d) or an encoder (8i).

10. The automated door system according to any of the preceding claims, **characterized in that** at least the assembly of the automated door system (1) that comprises the guide (5), the roller means (6; 6'), and the pair of gear wheels (10; 11) is made of wood.

11. The automated door system according to any of the preceding claims, **characterized in that** the door leaf (4) is made of wood, metal, glass, plastic.

12. A method of operating the automated door system according to any of the preceding claims, **characterized in that** it comprises the following steps:

a) production of appropriate or required cut-outs in the door leaf (4) at the place of installation of the motor unit (8) and touch means (13);
b) attachment of the guide (5) with the installed limiters (14; 14') of the door leaf (4) travel and the magnetic means (15) in the area above the door

opening (2);

c) attachment of the moving device (7) to the said door leaf (4) and placement on the said guide (5);

d) installation of a portable charging device (power bank) (8b), which enables calibration of the drive (8h) with respect to the opening direction of the door leaf (4), the door leaf (4) travel in one and/or the other direction, and the mass of the door leaf (4).

13. A method to control the automated door system according to claim 12, **characterized in that** the processing unit (8d) to calibrate the drive (8h) with respect to the opening direction of the door leaf (4) activates the drive (8h), which always moves the door leaf (4) in the first, left direction, and, when the door leaf (4) rests against the first limiter (14), the processing unit (8d) determines the first end position of the door leaf (4), wherein the processing unit (8d) stores the parameters determined in this way in the memory unit (8e).

14. A method to control the automated door system according to claim 13, **characterized in that**, when the sensor (8g) detects the magnetic means (15), the processing unit (8d) determines the first end position of the door leaf (4) as well as the closed position, wherein the processing unit (8d) stores the parameters determined in this way in the memory unit (8e).

15. The method to control the automated door system according to claim 12, **characterized in that** the processing unit (8d) to calibrate the drive (8h) with respect to the door leaf (4) travel activates the drive (8h) to start moving the door leaf (4) away from the first limiter (14) towards the second limiter (14') at the first, relatively low speed, and, when the door leaf (4) rests against the second limiter (14'), the processing unit (8d) determines the second end position of the door leaf (4), the door leaf (4) travel distance, and the open position, wherein the processing unit (8d) stores the parameters determined in this way in the memory unit (8e).

16. The method to control the automated door system according to claim 12, **characterized in that** the processing unit (8d) to calibrate the drive (8h) with respect to the mass of the door leaf (4) activates the drive (8h) to start moving the door leaf (4) away from the second limiter (14') towards the first limiter (14) at the second, relatively high speed, wherein, depending on the current energy consumption, the processing unit (8d) determines the mass of the door leaf (4), and wherein the parameters determined in this way are stored by the processing unit (8d) in the memory unit (8e).

17. A method to control the automated door system according to claim 16, **characterized in that** the said second, relatively high movement speed of the door leaf (4) is significantly higher than the said first, relatively low movement speed of the door leaf (4).

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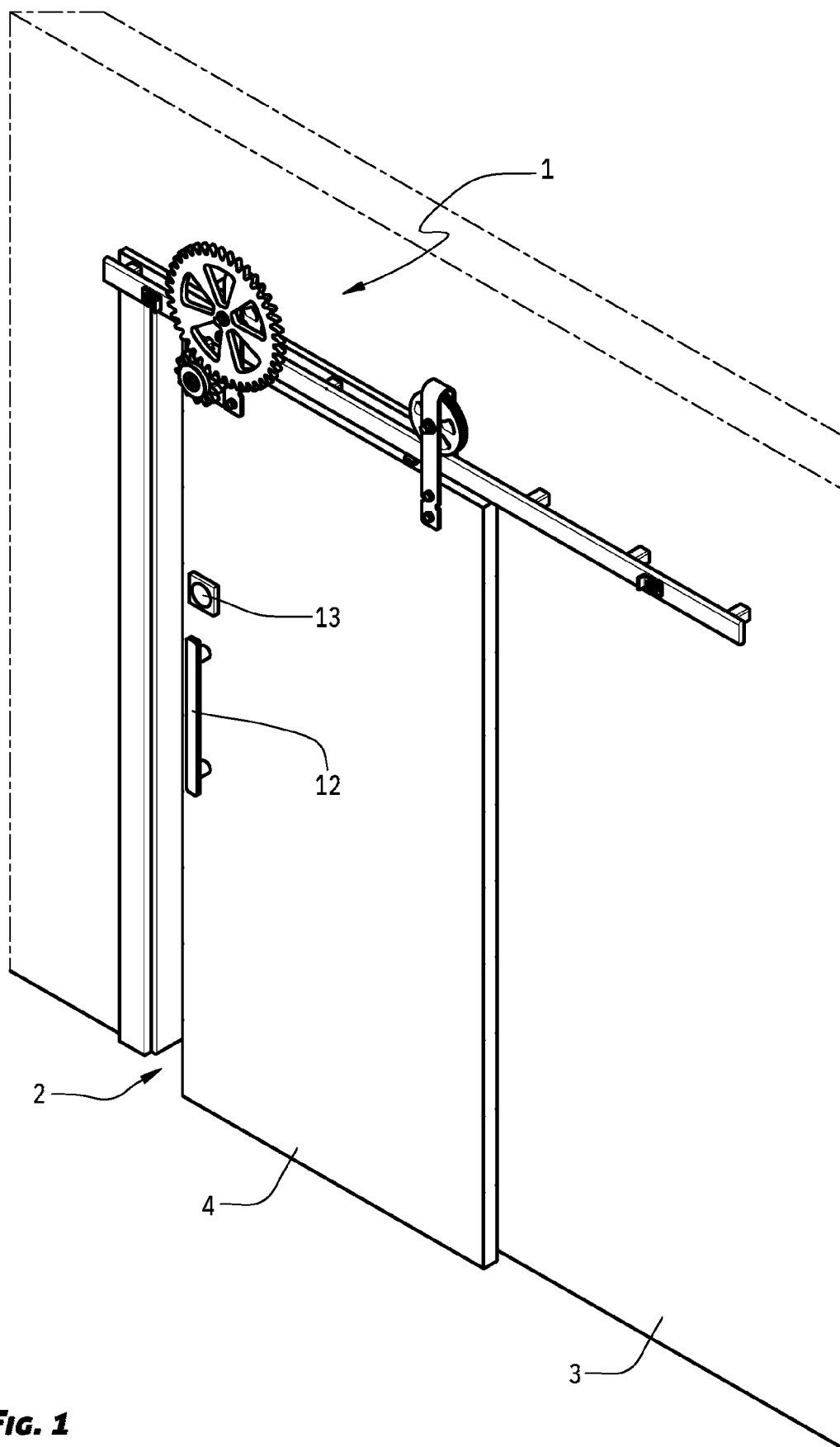


Fig. 1

FIG. 2

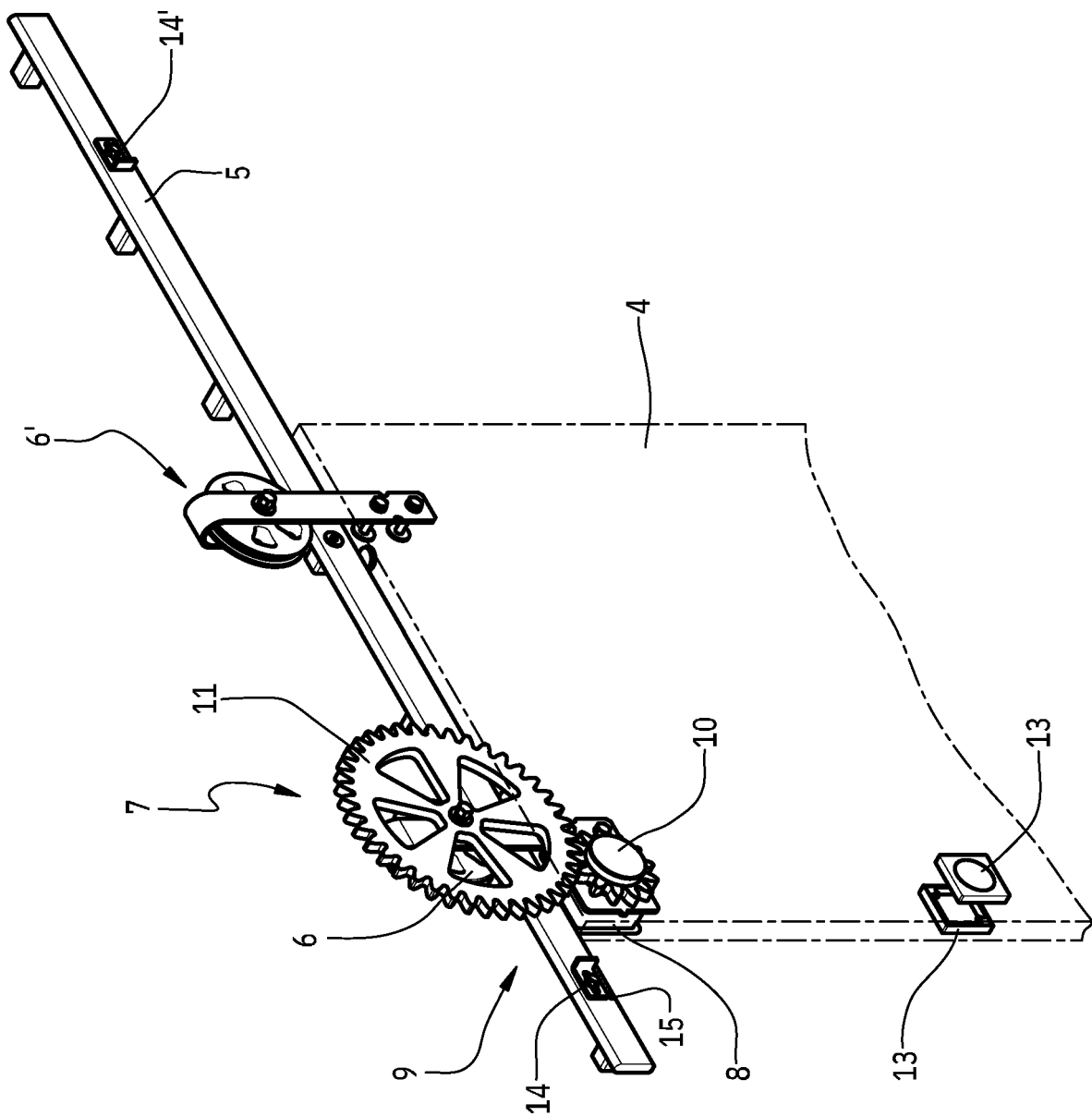
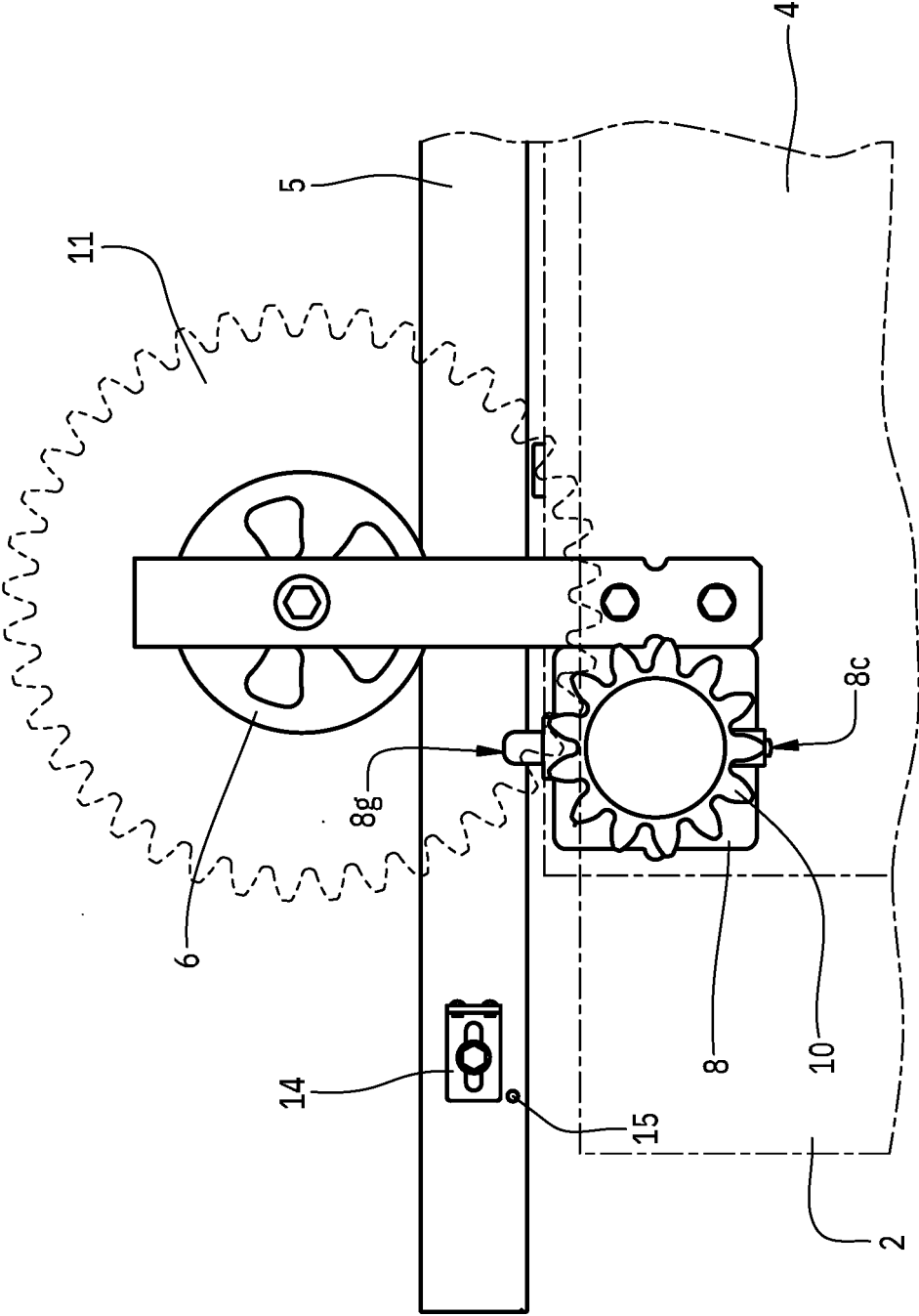


FIG. 3



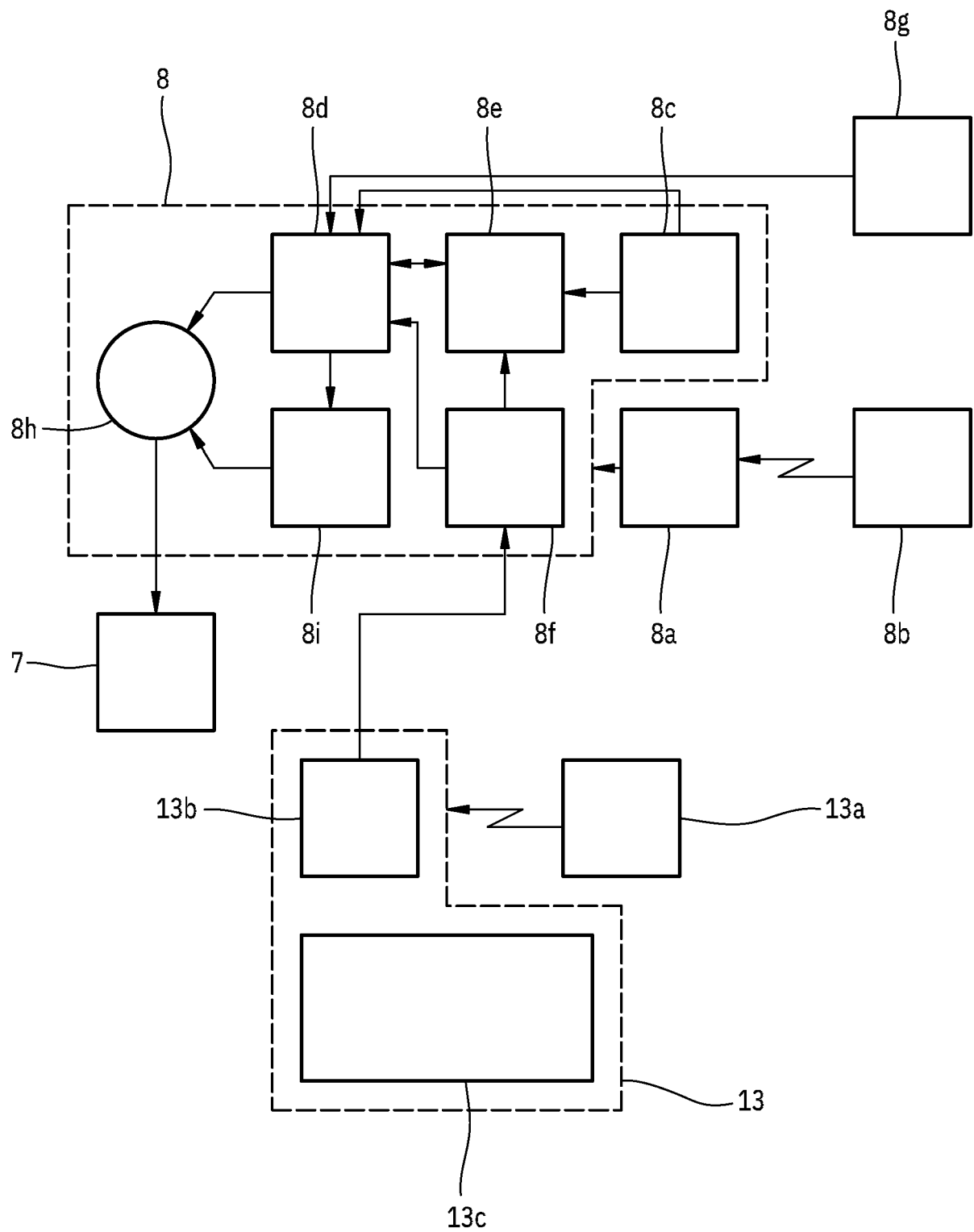


FIG. 4



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Application Number

EP 23 18 7981

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Place of search		Date of completion of the search	Examiner
The Hague		22 December 2023	Klemke, Beate
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

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