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(71) Applicant: **KONE Corporation**
00330 Helsinki (FI)

(72) Inventor: **Leenhouts, Sebastiaan**
00330 Helsinki (FI)

(74) Representative: **Kolster Oy Ab**
(Salmisaarenaukio 1)
P.O. Box 204
00181 Helsinki (FI)

(54) **ELECTROMECHANICAL LOCK FOR A SLIDING DOOR SYSTEM**

(57) The invention relates to sliding door systems in general and particularly to locking and unlocking arrangements for sliding door systems. The electromechanical lock according to the present invention is designed for a sliding door system (1), said sliding door system (1) comprising a motor (10), an at least one sliding door (50) and an electromechanical motor lock (30), wherein said motor (10) is arranged for moving said sliding door (50), wherein said motor (10) comprises a motor axle drive end (13), (16), (18), said motor axle drive end (13), (16), (18) comprising end spurs (14), (15), (17), (19) protruding outwards from the motor axle drive end (13), (16), (18), and wherein said electromechanical motor lock (30) comprises a lock slider (33) and an electromagnet (32), said electromagnet (32) being arranged to operate a plunger (34) inside said electromagnet (32) for either sliding said lock slider (33) away from the motor axle drive end (13), (16), (18) to an unlocked position or sliding said lock slider (33) towards the motor axle drive end (13), (16), (18) for said lock slider (33) to engage between said end spurs (14), (15), (17), (19) of the motor axle drive end (13), (16), (18) to a locked position.

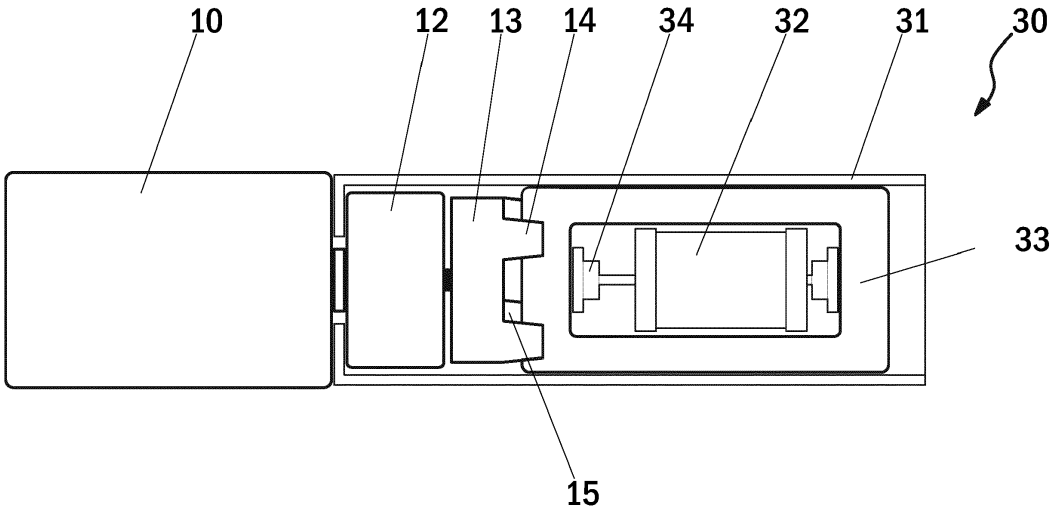

Fig. 3

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Description

FIELD OF THE INVENTION

[0001] The invention relates to sliding door systems in general and particularly locking and unlocking arrangements for sliding door systems. Said sliding door system is preferably a power-operated sliding door system.

BACKGROUND OF THE INVENTION

[0002] A sliding door is typically a door which opens horizontally by sliding, usually parallel to a wall. Many of the sliding doors are automatically operated and contain a motor and activation system for opening the sliding doors. Automatic sliding doors may typically also contain a locking mechanism, e.g. an electromechanical lock that automatically unlocks or locks the sliding doors during emergencies.

[0003] When installing sliding doors, placement of an electromechanical lock can be both time-consuming and complex. In a typical prior art solution there is an electromechanical latch lock that needs to be carefully aligned with one doorleaf in the case of single sliding door or with both doorleafs in the case of double sliding doors.

[0004] In prior art sliding door installations the locking arrangements typically consume a lot of mounting space. The large dimensions of the sliding door locking mechanisms and arrangements also tend to narrow the possible application range of said prior art sliding door system.

[0005] One drawback of the prior art sliding door installations and of the prior art locking arrangements is that the locking mechanisms have complex configurations and are complex to install and to operate.

[0006] Another drawback of the prior art sliding door installations and of the prior art locking arrangements is that the on-site installation is troublesome and time-consuming.

BRIEF DESCRIPTION OF THE INVENTION

[0007] The object of the invention is to introduce an electromechanical lock for a sliding door system, which provides a straightforward solution for locking the sliding doors and is easy to install and to operate.

[0008] It is brought forward a new electromechanical lock for a sliding door system, said sliding door system comprising a motor, an at least one sliding door and an electromechanical motor lock, wherein said motor is arranged for moving said sliding door, wherein said motor comprises a motor axle drive end, said motor axle drive end comprising end spurs protruding outwards from the motor axle drive end, and wherein said electromechanical motor lock comprises a lock slider and an electromagnet, said electromagnet being arranged to operate a plunger inside said electromagnet for either sliding said lock slider away from the motor axle drive end to an unlocked position or sliding said lock slider towards the motor axle drive end for said lock slider to engage between said end spurs of the motor axle drive end to a locked position. Hereby, one or more of the above-mentioned advantages and/or objectives are achieved. These advantages and/or objectives are further facilitated with the additional preferred features and/or steps described in the following.

[0009] In a preferred embodiment, said sliding door system also comprises a sliding door transmission arrangement, and wherein said motor is arranged for moving said sliding door by driving said sliding door transmission arrangement via a drive gear arrangement.

[0010] In a preferred embodiment, said electromechanical motor lock comprises a lock frame, wherein said lock slider is arranged to slide along said lock frame.

[0011] In a preferred embodiment, said lock frame comprises slot holes and/or slot openings in two sides of the lock frame, wherein said lock slider is arranged to slide along the slot holes and/or the slot openings.

[0012] In a preferred embodiment, said end spurs of the motor axle drive end are tooth-type end spurs and have sharply inclined spur slopes.

[0013] In an alternative preferred embodiment, said end spurs of the motor axle drive end are V-type end spurs and have narrow ends and slightly inclined spur slopes.

[0014] In another alternative preferred embodiment, said end spurs of the motor axle drive end are sharp-V-type end spurs and have narrow ends and sharply inclined spur slopes.

[0015] In a preferred embodiment, preferably 1% to 20%, more preferably 1% to 5%, and most preferably 1% to 2% of the surface area of the cross-section of the motor axle drive end is of said end spurs

[0016] In a preferred embodiment, said electromechanical motor lock also comprises one or more microswitches for activating/deactivating the electromagnetic force of said electromagnet.

[0017] In a preferred embodiment, said electromechanical motor lock also comprises one or more microswitches for communicating the lock status to a control unit of the sliding door system or to an external control system.

[0018] In a preferred embodiment, said at least one sliding door comprises two doorleafs arranged to slide in opposite directions.

[0019] In a preferred embodiment, said sliding door transmission arrangement is arranged to operate both of said two doorleafs simultaneously.

[0020] In a preferred embodiment, said electromechanical motor lock comprises a manual unlocking assembly, said manual unlocking assembly comprising a manually operated unlocking element arranged to push said lock slider to the unlocked position.

[0021] In a preferred embodiment, said manual unlocking assembly is clamped to a side of the lock frame.

[0022] It is also brought forward a new sliding door system, wherein said sliding door system comprises a motor, an at least one sliding door and an electromechanical motor lock, wherein said motor is arranged for moving said sliding door, wherein said motor comprises a motor axle drive end, said motor axle drive end comprising end spurs protruding outwards from the motor axle drive end, and wherein said electromechanical motor lock comprises a lock slider and an electromagnet, said electromagnet being arranged to operate a plunger inside said electromagnet for either sliding said lock slider away from the motor axle drive end to an unlocked position or sliding said lock slider towards the motor axle drive end for said lock slider to engage between said end spurs of the motor axle drive end to a locked position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] In the following, the present invention will be described in more detail by way of example and with reference to the attached drawings, in which:

Figure 1 illustrates a conceptual diagrammatic view of a sliding door system with an electromechanical motor lock according to one embodiment of the present invention.
Figure 2 illustrates a top view of an electromechanical motor lock in an unlocked position according to one embodiment of the present invention.
Figure 3 illustrates a top view of an electromechanical motor lock in a locked position according to one embodiment of the present invention.
Figure 4 illustrates a side view of a motor and a lock frame according to one embodiment of the present invention.
Figure 5 illustrates an exploded view of an electromechanical motor lock according to one embodiment of the present invention.
Figure 6 illustrates a front view of a motor axle drive end according to one embodiment of the present invention.
Figure 7 illustrates a front view of a motor axle drive end according to another embodiment of the present invention.
Figure 8 illustrates a front view of a motor axle drive end according to a third embodiment of the present invention.

[0024] The foregoing aspects, features and advantages of the invention will be apparent from the drawings and the detailed description related thereto.

DETAILED DESCRIPTION

[0025] Figure 1 illustrates a conceptual diagrammatic view of a sliding door system with an electromechanical motor lock according to one embodiment of the present invention. The presented sliding door system 1 comprises a motor 10, a sliding door transmission arrangement 20 and a sliding door 50. The sliding door system 1 according to the presented embodiment also comprises an electromechanical motor lock 30. In the presented embodiment the motor 10 is arranged for moving a sliding door 50 back and forth along an at least one door guide 24. In the presented embodiment the sliding door 50 has an at least one bracket 25, 26 for suspending said sliding door 50 from said at least one door guide 24. The sliding door transmission arrangement 20 of the presented embodiment comprises an at least one transmission belt 21 and at least two transmission pulleys 22, 23. At least one first bracket 25 of the said at least one bracket 25, 26 is attached to a first transmission belt 21 of the said at least one transmission belt 21.

[0026] The motor 10 according to the presented embodiment may e.g. be a direct current electric motor 10. The motor 10 may be arranged to move said sliding door 50 by driving said sliding door transmission arrangement 20 via a drive gear arrangement 11. In Figure 1 the presented embodiment shows only one sliding door 50, i.e. one doorleaf 50. It will be clear to those skilled in the art that another embodiment of the present invention may comprise two doorleafs arranged to slide in opposite directions. Likewise, the sliding door transmission arrangement 20 may be appropriately arranged in known manner to operate both of said two doorleafs simultaneously.

[0027] The electromechanical motor lock 30 of the sliding door system 1 according to the presented embodiment is arranged for stopping the rotation of the motor 10. As the rotation of the motor 10 is stopped, also the movement of said sliding door 50 is stopped.

[0028] Figure 2 illustrates a top view of an electromechanical motor lock in an unlocked position according to one embodiment of the present invention. The electromechanical motor lock 30 according to the presented embodiment comprises a lock frame 31, a lock slider 33, an electromagnet 32 and a plunger 34 inside said electromagnet 32. Said electromagnet 32 is arranged to operate said plunger 34 for sliding said lock slider 33 between an unlocked position and a locked position.

[0029] As illustrated in Figure 2, the motor 10 of the sliding door system 1 comprises a motor axle drive collar 12 and a motor axle drive end 13. The lock frame 31 according to the presented embodiment is arranged on the output axle of the motor 10 of the sliding door system so that the motor axle drive collar 12 and the motor axle drive end 13 are inside the lock frame 31. The motor axle drive end 13 according to the presented embodiment comprises end spurs 14, 15 protruding outwards from the motor axle drive end 13.

[0030] When the electromechanical motor lock 30 according to the presented embodiment is set to the unlocked position, electromagnet 32 is activated to push the plunger 34 for sliding the lock slider 33 away from the motor axle drive end 13 to an unlocked position. The activated electromagnetic force of the electromagnet 32 pushes the plunger 34 away from the motor axle drive

end 13. The plunger 34 pushes the lock slider 33 away from the motor axle drive end 13. Said lock slider 33 slides along the lock frame 31 away from the motor axle drive end 13 to the unlocked position. In the unlocked position said lock slider 33 is away from the motor axle drive end 13 allowing the motor axle turn freely to move said sliding door 50 of the sliding door system 10.

[0031] Figure 3 illustrates a top view of an electromechanical motor lock in a locked position according to one embodiment of the present invention. The electromechanical motor lock 30 according to the presented embodiment comprises a lock frame 31, a lock slider 33, an electromagnet 32 and a plunger 34 inside said electromagnet 32. As illustrated in Figure 3, the motor 10 of the sliding door system 1 comprises a motor axle drive collar 12 and a motor axle drive end 13. The motor axle drive end 13 according to the presented embodiment comprises end spurs 14, 15 protruding outwards from the motor axle drive end 13.

[0032] When the electromechanical motor lock 30 according to the presented embodiment is set to the locked position, electromagnet 32 is activated to push the plunger 34 for sliding the lock slider 33 towards the motor axle drive end 13 to a locked position. The activated electromagnetic force of the electromagnet 32 pushes the plunger 34 towards the motor axle drive end 13. The plunger 34 pushes the lock slider 33 towards the motor axle drive end 13. Said lock slider 33 slides along the lock frame 31 towards the motor axle drive end 13 and engages between the end spurs 14, 15 of the motor axle drive end 13 to the locked position. In the locked position said lock slider 33 is engaged between the end spurs 14, 15 of the motor axle drive end 13 locking the motor axle and locking said sliding door 50 of the sliding door system 10.

[0033] Figure 4 illustrates a side view of a motor and a lock frame according to one embodiment of the present invention. The lock frame 31 according to the presented embodiment is arranged on the output axle of the motor 10 of the sliding door system. The lock frame 31 comprises slot holes 35 and/or slot openings 36 in two sides of the lock frame 31. The lock slider 33 is arranged to slide along the slot holes 35 and/or the slot openings 36 in the sides of the lock frame 31 between an unlocked position and a locked position.

[0034] Figure 5 illustrates an exploded view of an electromechanical motor lock according to one embodiment of the present invention. The electromechanical motor lock 30 according to the presented embodiment comprises a lock frame 31, an electromagnet 32 and a lock slider 33.

[0035] Said electromagnet 32 is arranged to operate a plunger for sliding said lock slider 33 between an unlocked position and a locked position. For the unlocked position said lock slider 33 slides along the lock frame 31 away from the motor axle drive end 13. For the locked position said lock slider 33 slides along the lock frame 31 towards the motor axle drive end 13 and engages between the end spurs of the motor axle drive end 13.

[0036] The electromechanical motor lock according to presented embodiment may also comprise one or more microswitches 38, 39 and/or microswitch brackets 40, 41. The said one or more microswitches 38, 39 may be used to activate/deactivate the electromagnetic force of the electromagnet 32. The said one or more microswitches 38, 39 may also be used to communicate the lock status to a control unit of the sliding door system 1 or to an external control system.

[0037] Figure 6 illustrates a front view of a motor axle drive end according to one embodiment of the present invention. The motor axle drive end 13 according to the presented embodiment comprises end spurs 14, 15 protruding outwards from the motor axle drive end 13. The outwards protruding end spurs 14, 15 are tooth-type end spurs 14, 15 and have sharply inclined spur slopes 141, 142.

[0038] Figure 7 illustrates a front view of a motor axle drive end according to another embodiment of the present invention. The motor axle drive end 16 according to the presented another embodiment comprises end spurs 17 protruding outwards from the motor axle drive end 16. The outwards protruding end spurs 17 are V-type end spurs 17 and have narrow ends and slightly inclined spur slopes 171, 172.

[0039] Figure 8 illustrates a front view of a motor axle drive end according to a third embodiment of the present invention. The motor axle drive end 18 according to the presented third embodiment comprises end spurs 19 protruding outwards from the motor axle drive end 18. The outwards protruding end spurs 19 are Sharp-V-type end spurs 19 and have narrow ends and sharply inclined spur slopes 191, 192.

[0040] Preferably 1% to 20%, more preferably 1% to 5%, and most preferably 1% to 2% of the surface area of the cross-section of the motor axle drive end 13, 16, 18 is of the aforementioned outwards protruding end spurs 14, 15, 17, 19. Because only a small portion of the surface area of the cross-section of the motor axle drive end 13, 16, 18 is of the aforementioned outwards protruding end spurs 14, 15, 17, 19 the locking is more smooth and secure as it is very easy for said lock slider 33 slide and engage between the end spurs of the motor axle drive end 13, 16, 18.

[0041] The electromechanical motor lock according to present invention may also comprise a manual unlocking assembly, said manual unlocking assembly comprising a manually operated unlocking element arranged to push said lock slider 33 to the unlocked position. Said manual unlocking assembly may be simply clamped to a side of the lock frame 31.

[0042] With the help of the electromechanical lock according to the present invention the installation, process of installing the lock directly on a modified motor unit is simplified and faster when compared to prior art solutions.

[0043] With the help of the electromechanical lock ac-

cording to the present invention, the maintenance of the sliding door system and of the electromechanical lock is easier. With the help of smaller cross-sectional dimensions, the electromechanical lock according to the present invention also has a much wider application range.

[0044] With the help of the electromechanical lock according to the present invention, directly locking on the motor end the force that is exerted on the doorleaf and belt system may be reduced.

[0045] It is to be understood that the above description and the accompanying Figures are only intended to teach the best way known to the inventors to make and use the invention. It will be apparent to a person skilled in the art that the inventive concept can be implemented in various ways. The above-described embodiments of the invention may thus be modified or varied, without departing from the invention, as appreciated by those skilled in the art in light of the above teachings. It is therefore to be understood that the invention and its embodiments are not limited to the examples described above but may vary within the scope of the claims and their equivalents.

Claims

1. An electromechanical lock for a sliding door system (1), said sliding door system (1) comprising a motor (10), an at least one sliding door (50) and an electromechanical motor lock (30),

- wherein said motor (10) is arranged for moving said sliding door (50),
- wherein said motor (10) comprises a motor axle drive end (13), (16), (18), said motor axle drive end (13), (16), (18) comprising end spurs (14), (15), (17), (19) protruding outwards from the motor axle drive end (13), (16), (18), and
- wherein said electromechanical motor lock (30) comprises a lock slider (33) and an electromagnet (32), said electromagnet (32) being arranged to operate a plunger (34) inside said electromagnet (32) for either sliding said lock slider (33) away from the motor axle drive end (13), (16), (18) to an unlocked position or sliding said lock slider (33) towards the motor axle drive end (13), (16), (18) for said lock slider (33) to engage between said end spurs (14), (15), (17), (19) of the motor axle drive end (13), (16), (18) to a locked position.

2. An electromechanical lock according to claim 1, wherein said sliding door system (1) also comprises a sliding door transmission arrangement (20), and wherein said motor (10) is arranged for moving said sliding door (50) by driving said sliding door transmission arrangement (20) via a drive gear arrangement (11).

3. An electromechanical lock according to claim 1 or to claim 2, wherein said electromechanical motor lock (30) comprises a lock frame (31), wherein said lock slider (33) is arranged to slide along said lock frame (31).

4. An electromechanical lock according to claim 3, wherein said lock frame (31) comprises slot holes (35) and/or slot openings (36) in two sides of the lock frame (31), wherein said lock slider (33) is arranged to slide along the slot holes (35) and/or the slot openings (36).

5. An electromechanical lock according to any of the preceding claims 1-4, wherein said end spurs (14), (15) of the motor axle drive end (13) are tooth-type end spurs (14), (15) and have sharply inclined spur slopes (141), (142).

6. An electromechanical lock according to any of the preceding claims 1-4, wherein said end spurs (17) of the motor axle drive end (13) are V-type end spurs (17) and have narrow ends and slightly inclined spur slopes (171), (172).

7. An electromechanical lock according to any of the preceding claims 1-4, wherein said end spurs (19) of the motor axle drive end (13) are sharp-V-type end spurs (19) and have narrow ends and sharply inclined spur slopes (191), (192).

8. An electromechanical lock according to any of the preceding claims 1-7, wherein preferably 1% to 20%, more preferably 1% to 5%, and most preferably 1% to 2% of the surface area of the cross-section of the motor axle drive end (13), (16), (18) is of said end spurs (14), (15), (17), (19).

9. An electromechanical lock according to any of the preceding claims 1-8, wherein said electromechanical motor lock (30) also comprises one or more microswitches (38), (39) for activating/deactivating the electromagnetic force of said electromagnet (32).

10. An electromechanical lock according to any of the preceding claims 1-9, wherein said electromechanical motor lock (30) also comprises one or more microswitches (38), (39) for communicating the lock status to a control unit of the sliding door system (1) or to an external control system.

11. An electromechanical lock according to any of the preceding claims 1-10, wherein said at least one sliding door (50) comprises two doorleafs arranged to slide in opposite directions.

12. An electromechanical lock according to claim 11, wherein said sliding door transmission arrangement

(20) is arranged to operate both of said two doorleafs simultaneously.

13. An electromechanical lock according to any of the preceding claims 1-12, wherein said electromechanical motor lock (30) comprises a manual unlocking assembly, said manual unlocking assembly comprising a manually operated unlocking element arranged to push said lock slider (33) to the unlocked position.

14. An electromechanical lock according to claim 13, wherein said manual unlocking assembly is clamped to a side of the lock frame (31).

15. A sliding door system (1), wherein said sliding door system (1) comprises an electromechanical lock according to any of the preceding claims 1-14.

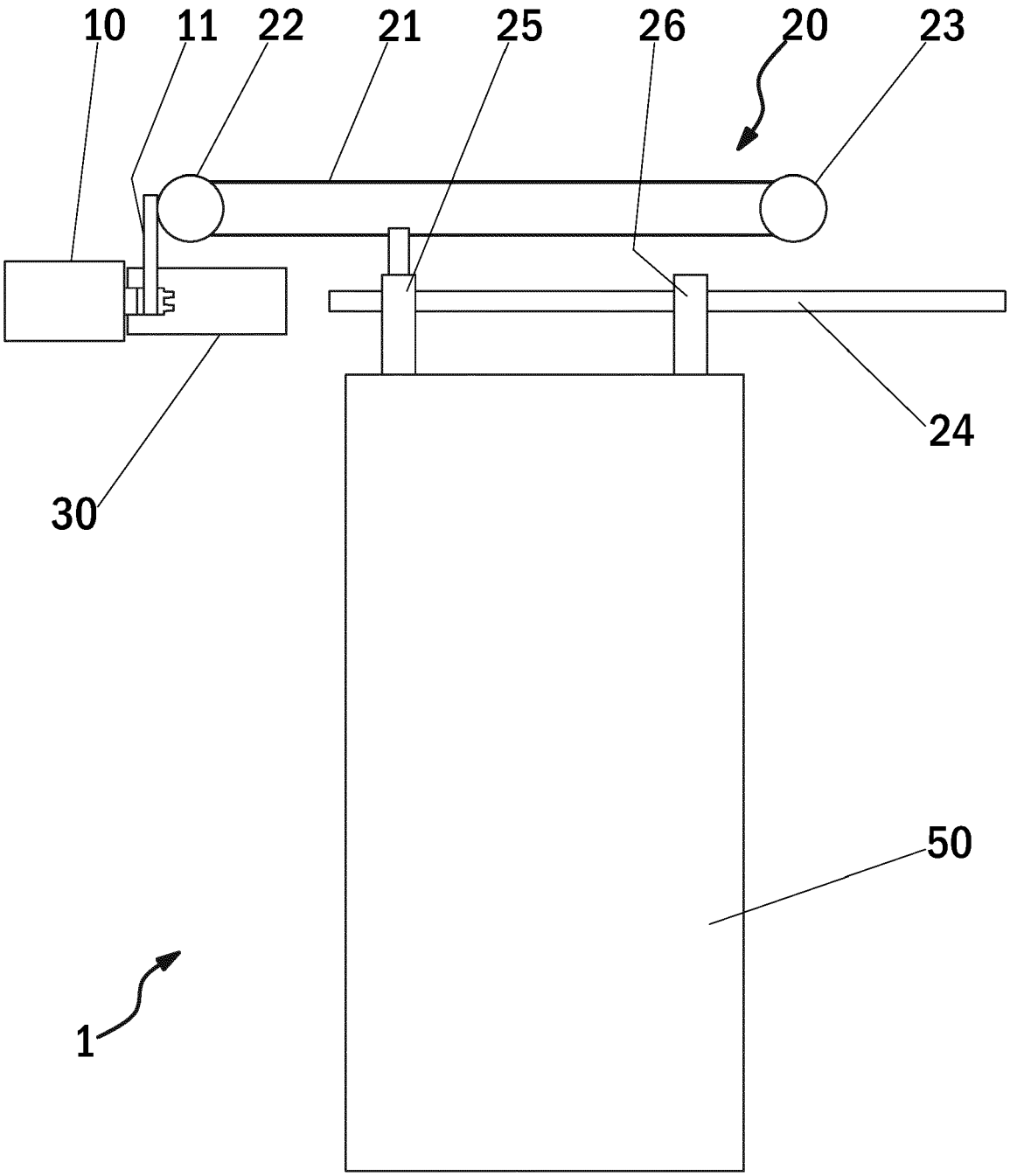

Fig. 1

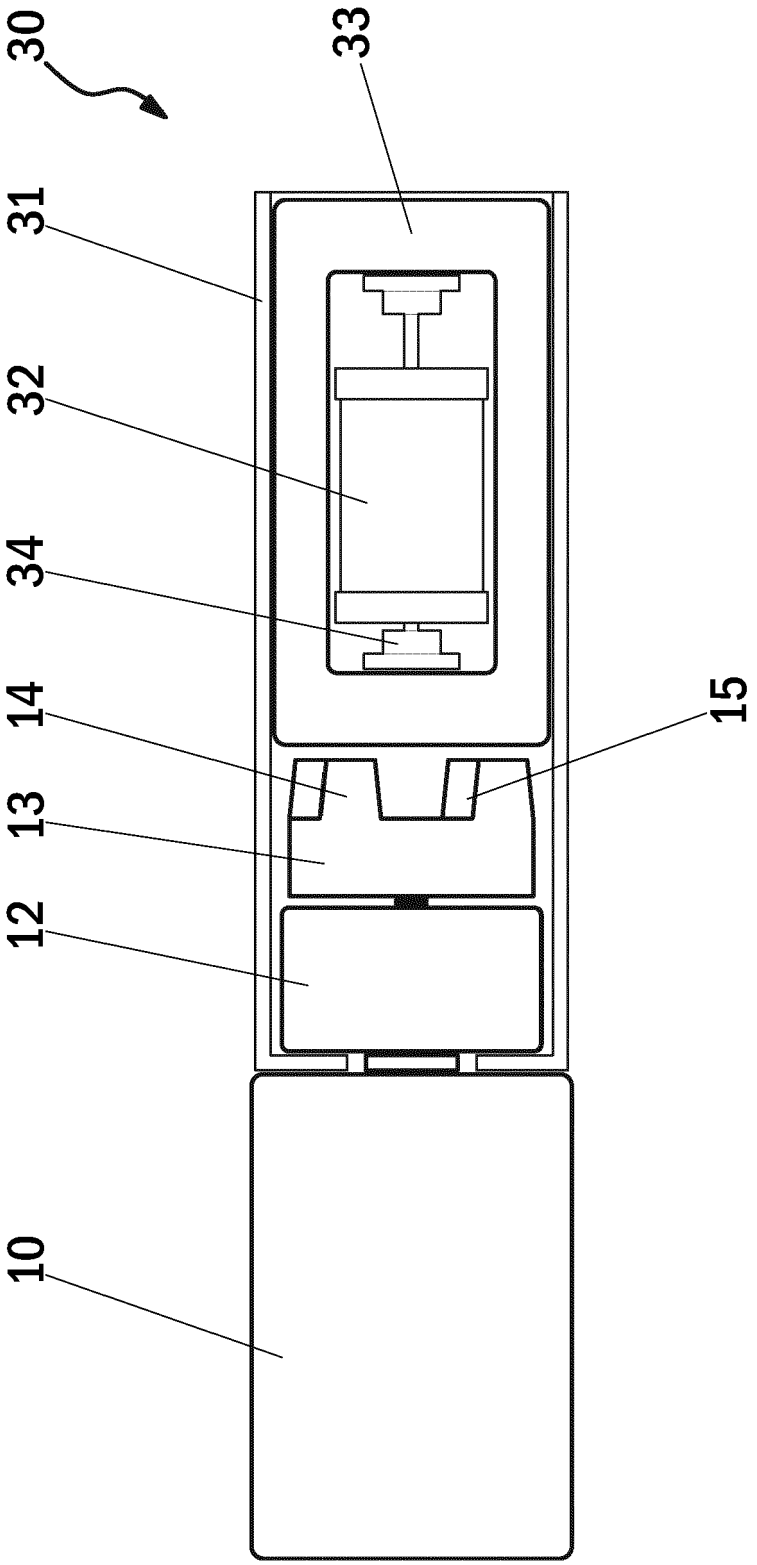

Fig. 2

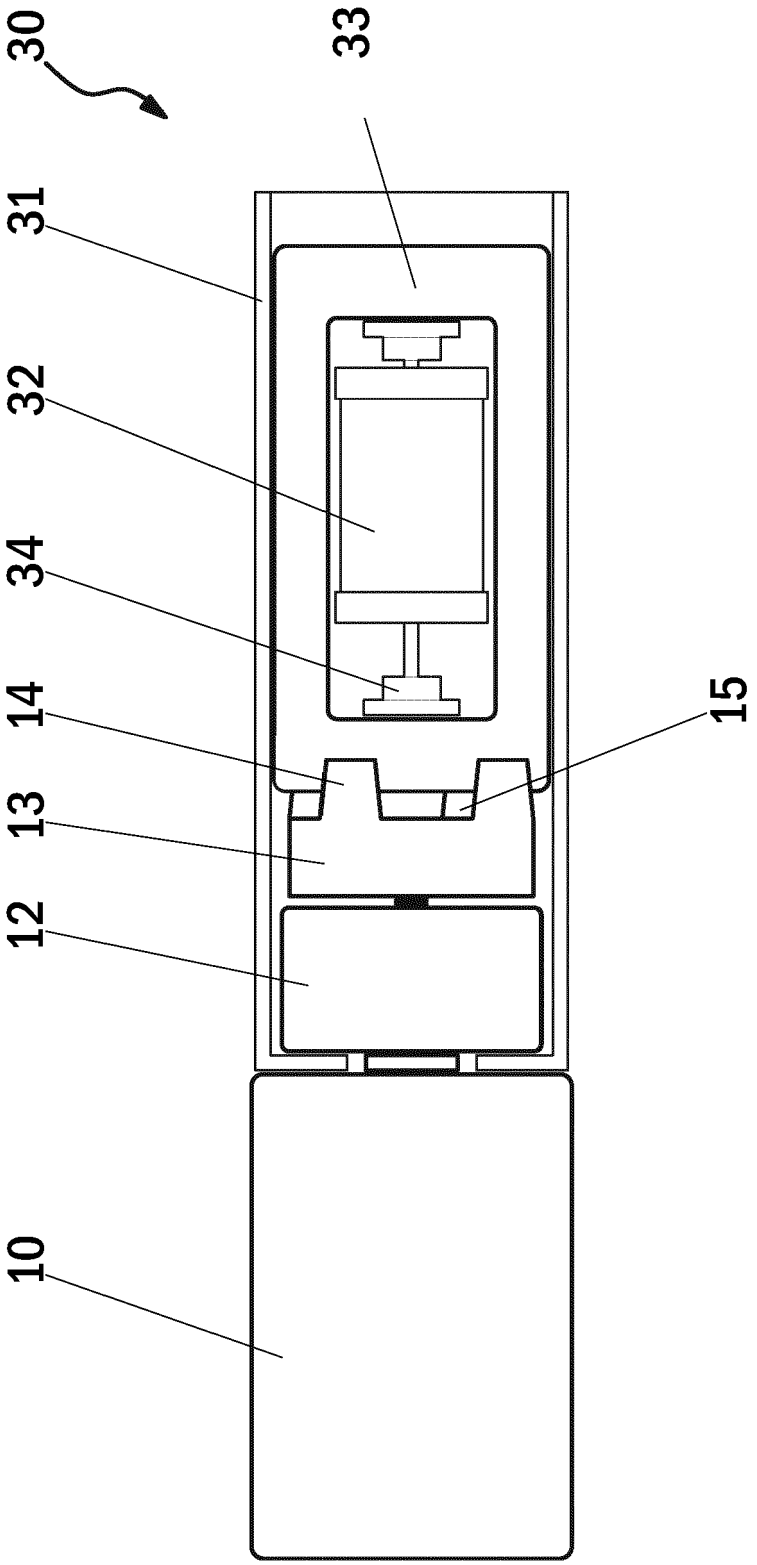

Fig. 3

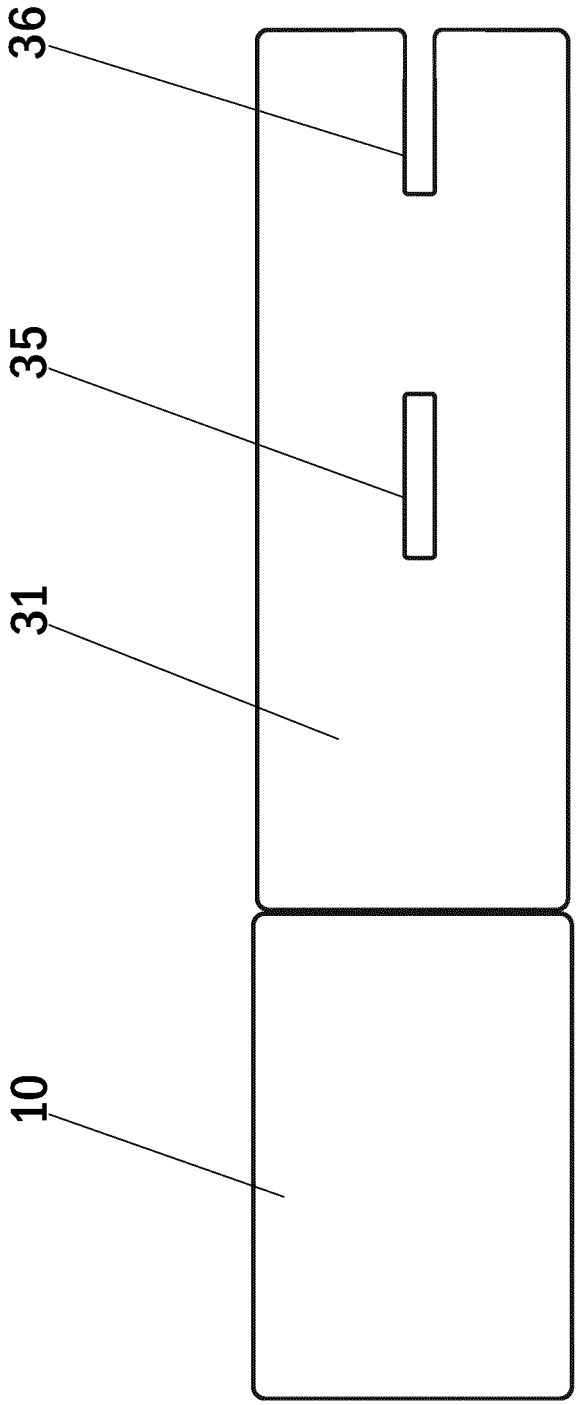

Fig. 4

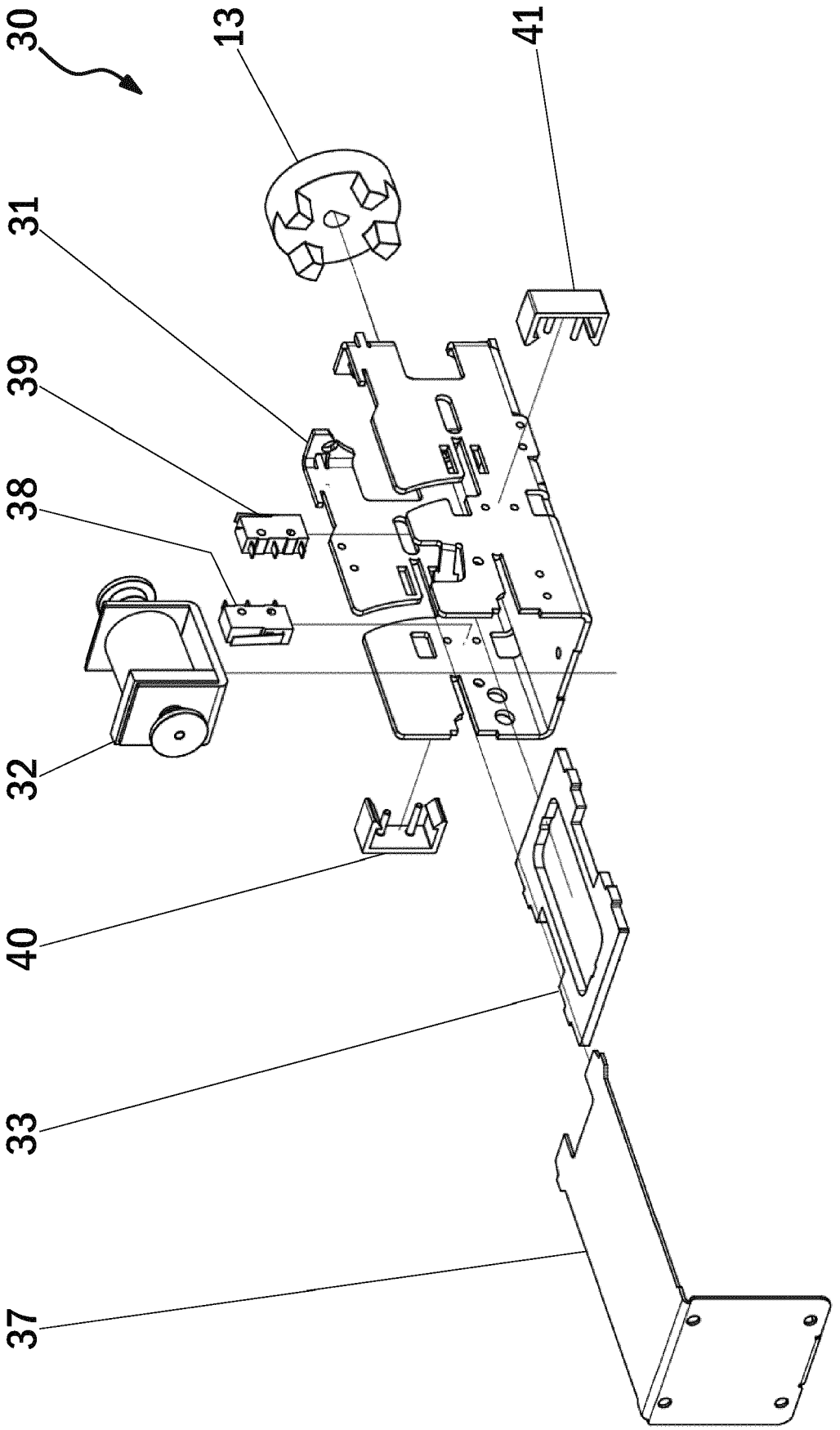

Fig. 5

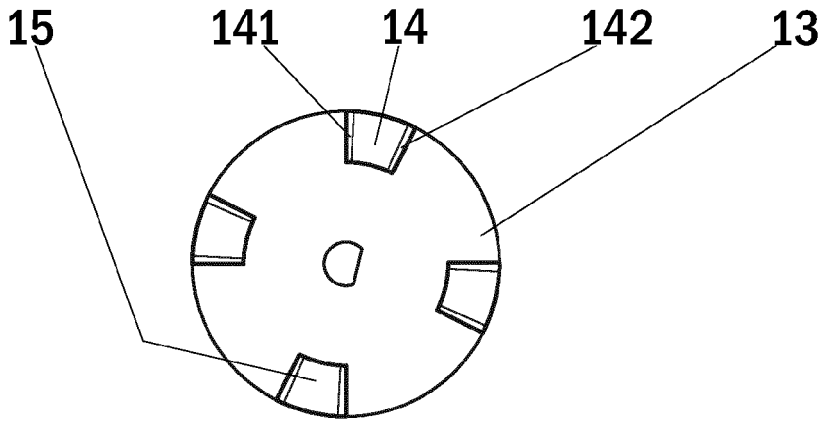

Fig. 6

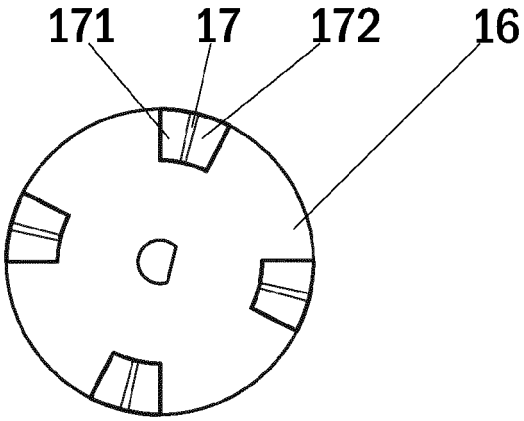

Fig. 7

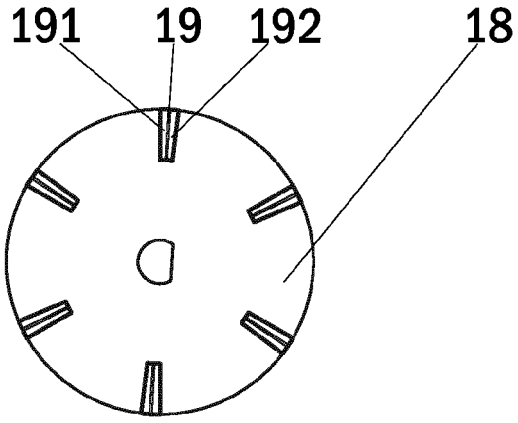

Fig. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 17 19 1383

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 365 095 A2 (FAAC SPA [IT]) 26 November 2003 (2003-11-26) * paragraph [0007] - paragraph [0017]; figures 1-3 * * paragraph [0026] * -----	1-15	INV. E05F15/643

TECHNICAL FIELDS SEARCHED (IPC)

E05F
E05D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 March 2018	Berote, Marc

CATEGORY OF CITED DOCUMENTS

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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