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(54) **Method of operating a roller door arrangement**

(57) The present invention relates to a method of operating a roller door arrangement (1, 101, 201), said roller door arrangement (1, 101, 201) comprising a flexible door screen (3, 103, 203) movable between a closed position and an open position, and vice versa, and a winding roller (5, 105, 205) mounted rotably at the door way for winding and unwinding of the flexible door screen (3, 103, 203), wherein said method comprising the steps of: bringing the flexible door screen (3, 103, 203) towards a closed condition of said door arrangement (1, 101, 201) by operating the winding roller (5, 105, 205) in a first rotational direction; bringing at least a lower part of the flexible door screen (3, 103, 203) into a condition held by a holding element (15, 115, 215), relatively to a fix structure (13, 113, 213) surrounding the roller door arrangement (1, 101, 201); stretching the flexible door screen (3, 103, 203) by a reversing operation of the winding roller (5, 105, 205) in a second rotational direction opposite to the first rotational direction.

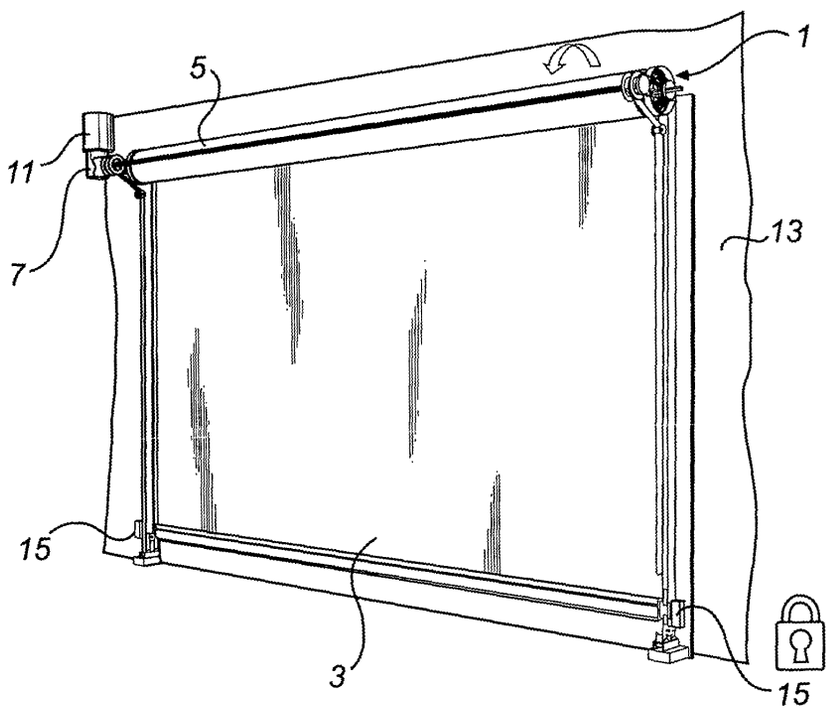

Fig. 1c

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Description

Technical field

[0001] The present invention relates to a method of operating a roller door arrangement, said roller door arrangement comprising a flexible door screen movable between a closed position and open position, and vice versa, and a winding roller mounted rotably at the door way for winding and unwinding of the flexible door screen.

Background of the invention

[0002] A roller door arrangement according to the preamble of claim 1 usually comprises a flexible door leaf arranged to be operated between a closed position and an open position, and vice versa.

[0003] There is often a need for reducing a deflection of the flexible door leaf when exposed to e.g. a wind load. Additionally, a stretching of the flexible door leaf enhance the quality impression and the appearance of the roller door arrangement.

[0004] Generally, roller door arrangements are provided with reinforcement bars in order to stretch the door leaf. The reinforcement bars are often arranged across the flexible door leaf. Such reinforcement bars may be a potential cause of jam during opening and closing operation of the roller door arrangement. Usually, such reinforcement bars are engaged and guided within guide rails of a roller door arrangement, wherein it exist a potential cause of accidental release of the bars as a consequence of applied wind loads. Accidental release of a flexible door leaf, due to wind loads, is a common issue for roller door arrangements used outdoor as well as indoor. For indoor arrangements the wind loads can occur due to draught.

[0005] Further, a roller door arrangements comprising reinforcement bars may be voluminous and thereby enlarge the diameter of the winding roller in an unsuitable way when wounded in the open position. Another issue for roller door arrangements comprising reinforcement bars is often generation of noise during operation, which may be disturbing for a person adjacent to the roller door arrangement.

[0006] GB1444017 describes an alternative roll-up door having a flexible door leaf which is arranged to be wound, selectively, onto and off a roller. The roll-up door comprises trolleys arranged at each lower corner of the door leaf, wherein said trolleys running in contact with guide rails. These trolleys maintain the door leaf in a stretched condition in the lateral position. Further, the described roll-up door comprises weights at each side of the door leaf, which weights exerting a downwards pulling effect on the trolleys via wires. Hence, the door leaf will be maintained in a stretched condition in the vertical direction.

[0007] The described door, arranged with weights and counterweights used for the stretching of the door leaf, imply an added weight to be handled during operation and start/stop of the roller door arrangement.

[0008] EP0374333 describes an alternative way of operating a door leaf of a roller door arrangement. The described door arrangement consist of a self-supporting frame which supports a drum with a motorized rolling. A curtain is attached to the drum and said curtain is stretched by means of a system with straps guided by rollers. Each strap is stretched by an elastic element, such as a spring. One reason for such an arrangement is to obtain a balanced operation of the door arrangement and consequently some stretch of the door leaf will be introduced. However, the described arrangement is not convenient in order to avoid blow in and obtain stretching of the door leaf. Hence, there is a need for an improved roller door arrangement, and in particular a roller door arrangement suitable to withstand wind loads.

Summary of the invention

[0009] An object of the present invention is to provide a method of operating a roller door arrangement that at least partly overcomes the above issues, and present a method which is applicable for different kind of roller door arrangements.

[0010] An additionally object of the present invention is to provide a method of operating a roller door arrangement suitable for providing a roller door arrangement withstanding wind loads.

[0011] These and other objects, which will become apparent in the following description, are achieved by a method of operating a roller door arrangement defined in the independent claim.

[0012] A first aspect of the invention relates to, a method of operating a roller door arrangement, said roller door arrangement comprising a flexible door screen movable between a closed position and an open position, and vice versa, and a winding roller mounted rotably at the door way for winding and unwinding of the flexible door screen, wherein said method comprising the steps of:

- bringing the flexible door screen towards a closed condition of said door arrangement by operating the winding roller in a first rotational direction;
- bringing at least a lower part of the flexible door screen into a condition held by a holding element, relatively to a fix structure surrounding the roller door arrangement;
- stretching the flexible door screen by a reversing operation of the winding roller in a second rotational direction opposite to the first rotational direction.

[0013] A particular advantage with the method according to the invention is the possibility to establish a roller door arrangement that may stand wind loads, in

its closed position, in a proper way. Further the method provides for a simple and robust design of the roller door arrangement comprising a few components for establishing a stretching effect and retaining effect usable for different kind of roller door arrangement designs.

[0014] Further, the method according to the invention provides for a roller door arrangement with a fast acting winding and unwinding of the flexible door screen, without the need of weights and tension systems for additionally stretching of the flexible door screen.

[0015] Additionally, stretching the flexible door screen by a reversing operation of the winding roller in a second rotational direction opposite to the first rotational direction, provides for a roller door arrangement with the opportunity to choose the force applied for the stretching in a simple way. Further, potential elongation of the flexible door screen over the time may be compensated by said reversing operation of the winding roller.

[0016] Yet an additional result of the method according to the invention is a roller door arrangement with a stretched flexible door screen giving a good visual quality, which for instance may enhancing the visual properties of a flexible door screen comprising a transparent portion.

[0017] Preferably, lower bar end portions of the flexible door screen is guided in guides. Alternative, lateral side portions of the flexible door screen may be guided in guides. Hence, the flexible door screen may be operatively associated with the fix structure surrounding the door way. In yet an alternative embodiment, both the lateral end portions of the flexible door screen and end portions of the lower bar may be guided by said guides.

[0018] According to a preferred method, the holding element is operated electrically. An electrically operated holding element provides for the possibility of operating the holding and release of the at least lower part of the flexible door screen in an accurately way. Further, the use of a electrically operated holding element provides for a holding and release action without adding any additionally mechanically forces to the roller door arrangement.

[0019] According to a preferred method, the torque applied by the winding roller is sensed during the stretching of the flexible door screen in order to provide a predetermined stretching force to the flexible door screen. The predetermined stretching force may be adapted to different conditions, such as applied wind loads.

[0020] According to an alternative method, the time while the winding roller is reversed in the second rotational direction is measured, during the stretching of the flexible door screen, in order to provide a predetermined stretching force to the flexible door screen.

[0021] Advantageously, the wind load applied to the flexible door screen is sensed in order to adjust the stretching of the flexible door screen by either operating the winding roller in the first rotational direction, to decrease the stretch, or operating the winding roller in the second rotational direction, to increase the stretch. By such a method, the load applied to the roller door arrangement is not higher than needed, wherein the working life of the roller door arrangement may be enhanced.

[0022] According to one preferred method, the holding of at least a lower part of the flexible door screen is effected by an initial reversing operation in the closed position of the door arrangement. The holding of the flexible door screen may either be effected in a mechanically or an electrically way when the winding roller is reversed.

[0023] According to additionally one preferred method, the holding of the flexible door screen is released by initiating an opening movement. The applied force from the opening movement of the roller door arrangement either release or represents a trigger input for the release of the held lower part of the flexible door screen.

[0024] According to an especially preferred embodiment, the holding element is effected by a solenoid for operation between an engaged and a disengaged condition of the flexible door screen. The use of a solenoid gives a robust and reliable operation of the holding element, which preferably is operated by a control system of the roller door arrangement. The use of a solenoid may also enabling a simultaneous release in case of an opening operation, wherein the lower part of the flexible door screen is held at several places by more than one solenoid. Further, the lower part of the flexible door screen according to a preferred embodiment suitably is brought to the held condition by holding a substantially rigid lower bar. In an alternative embodiment, the flexible door screen is brought to the held condition by holding a substantially flexible lower bar.

Brief description of the drawings

[0025] By way of examples, embodiments of the invention will now be described with reference to the accompanying drawings in which:

Figs. 1a-1c in a perspective view disclose a method of operating a roller door arrangement in order to stretch a flexible door screen in its closed position.

Figs. 2a-2b in perspective view presents a sequence for opening of the roller door arrangement according to figs 1a-1c.

Fig. 3 in a perspective partial view shows one embodiment of a roller door arrangement suitable for the method according to the invention.

Fig. 4 in a perspective partial view shows an additional embodiment of a roller door arrangement suitable for the method according to the invention.

Fig. 5 is a perspective partial view, which comprises yet an additional embodiment of a roller door arrangement suitable for the method according to the invention.

Figs. 6a-6b in a partial front view disclose a preferred embodiment of a holding element for holding

the flexible door screen.

Figs. 7a-7b in a sectional view presents the holding element according to figs. 6a-6b.

Detailed description of the drawings

[0026] Referring now to figure 1a-1c, wherein a preferred embodiment of a roller door arrangement (1) comprises a flexible door screen (3), wound on a winding roller (5) which is mounted rotably at the door opening. The roller door arrangement (1) is provided with at least one driving device (7) for applying a driving force on the flexible door screen (3), to enable the flexible door screen (3) to be operated between an open position and a closed position.

[0027] The winding roller (5) is connected to a shaft associated rotably to a motor (11), e.g. an electrical motor, forming part of a driving device (7). Further, the driving device (7) preferably comprises a driving gear for the transmission of power from the motor (11) to the winding roller (5). The driving device (7) and hence the winding roller (5) is able to move along with a forward and backward motion.

[0028] Referring now to figure 1a-c, a preferred method for operating a roller door arrangement (1) is illustrated in a schematic way. Especially, the preferred method relates to a manner of stretching the flexible door section (3) of a roller door arrangement (1) in its closed position.

[0029] According to figure 1a, the winding roller (5) is operated in a first rotational direction in order to bring the flexible door screen (3) from an open position towards a closed position of the roller door arrangement (1). When the flexible door screen (3) reaches its lower position the motor (11) is stopped.

[0030] In figure 1b, at least a lower part of the flexible door screen (3) is brought into a held state relatively to a fix structure (13) surrounding the roller door arrangement (1). The holding of the at least lower part of the door screen (3) is preferably achieved by a holding element (15). The holding element (15) is described more in detail below by the way of exemplifying embodiments.

[0031] When the flexible door screen (3) is held in the closed position by the holding element (15), the winding roller (5) is operated in a second rotational direction as shown in figure 1c, opposite to the first rotational direction during closing of the door arrangement (1). Hence, the flexible door screen (3) is wound onto the winding roller (5). The winding of the held flexible door screen (3) applies a stretching force that stretches the flexible door screen (3), mainly in its lateral direction.

[0032] When the flexible door screen (3) is stretched with a suitably stretching force, the operating of the winding roller (5) in the second rotational direction is switched off and hence the flexible door screen (3) is maintained stretched between the winding roller (5) and the lower part. The maintained stretching of the flexible door screen is preferably achieved by a irreversible gear or a brake, arranged for holding the winding roller.

[0033] The stretching is preferably applied with a predetermined value. Preferably, the applied stretching may be registered by sensing the torque applied by the driving device (7) to the winding roller (5). In an alternative way, the applied stretching is determined by measuring the time while the winding roller (5) is operated in the reversed second rotational direction. A person skilled in the art realize that the described methods of determining the applied stretch exemplifying some preferred embodiments, among others, such as use of strain gauges, mechanical stoppers, stepping motors, etc.

[0034] In a preferred embodiment of the method of operating a roller door arrangement (1), the at least lower part of the flexible door screen (3) is disengaged from the holding element (15) according to figure 2a before opening of the roller door arrangement (1). When the flexible door screen (3) is released from the holding, the stretching force expire and the flexible door screen (3) is operatively free to move in relation to the fix structure (13) surrounding the roller door arrangement. Figure 2b shows the opening of the roller door arrangement (1) by operating the winding roller (5) in the second rotational direction for winding of the flexible door screen (3).

[0035] In an especially preferred embodiment, the winding roller (5) is operated in the first rotational direction in order to reduce the stretch of the flexible door screen (3) before the holding element (15) is released.

[0036] The above described method may be used for different kind of operation arrangements for roller door arrangements (1).

[0037] Figure 3 illustrates one embodiment of the roller door arrangement (1), comprising a tension system (17) for the operation of the flexible door screen (3) between the closed and opened position, and vice versa. The winding roller (5) is integrally rotatably connected to a drum (19) on which is wound, in a contrary direction to the flexible door screen (3), a flexible traction member (21), said flexible traction member (21) describing a path from said winding roller (5) around at least one guiding roller (23) at the base of the door opening via a tensioning roller (25) to said drum. Further, the embodiment according to figure 2 is provided with a substantially rigid lower bar (27).

[0038] Figure 4 illustrates an alternative embodiment of the roller door arrangement (101), wherein the flexible door screen (103) is provided with a lower bar (127) which serves as a weight for the lowering of the door screen (103) towards the closed position when the winding roller (105) is operated in the first rotational unwinding direction.

[0039] According to the embodiments shown in figures 3 and 4, the lateral side portions of the flexible door screen and/or the end portions of the lower bar is optionally guided in guides (9, 109).

[0040] Figure 5 illustrates additionally one embodiment of the roller door arrangement (201), wherein the lateral edges of the flexible door screen (203) is guided

in guides (209) and provided with substantially rigid elements (229) in the lengthwise direction. Each one of the substantially rigid elements (229) are arranged to being supported by an adjacent element (229) when the screen is unwounded from the winding roller (205), wherein a compressive force may be applied for the lowering of the flexible door screen (203). Further, the substantially rigid elements (229) are arranged to pivot relatively to each other when the flexible door screen (203) is wounded on the winding roller (205) during opening of the door arrangement (201). It shall be noted that the substantially rigid elements (229) may be formed in several ways.

[0041] Figure 6a-6b shows a preferred embodiment of the holding element (15) for holding the at least lower part of the flexible door screen (3). The holding element (15) according to figure 6a comprises a solenoid (31) attached to an engagement device (33) by the way of an intermediate shaft (35). The engagement device (33) is pivotable arranged by a joint (37). According to figure 6a, the holding element (15) is illustrated in the position holding the flexible door screen (3), wherein the engagement device (33) prevents the lower part of the flexible door screen (3) from being raised. In the preferred embodiment shown in figure 6a, the engagement device (33) is arranged to be brought into engagement with a lower bar (27) of the roller door arrangement (1). Further, the engagement device (33) is preferably supported by a substantially fix element in order to prevent pivoting when the winding roller (5) is operated in the second rotational direction in order to stretch the flexible door screen (3).

[0042] However, figure 6b illustrates the holding element (15) in a released position, wherein the flexible door screen (3) is free to be raised towards an open position when the winding roller (5) is operated in the second rotational direction.

[0043] In an especially preferred embodiment according to figures 7a-7b, the solenoid (31) is arranged as a traction solenoid. The shaft is spring loaded in an outwardly direction from the solenoid (31) towards the position holding the lower part of the flexible door screen (3). When the flexible door screen (3) is moved from the open position towards the closed position the spring loaded solenoid (31) allows the lower part to pass the engagement device (33) and holding it in the closed position. The holding element (15) is released from the lower part of the flexible door screen (3) by activation of the solenoid (31), wherein the shaft (35) translates into the solenoid (31) and the spring is compressed. It shall be noted that the solenoid (31) may be arranged in several ways, and therefore the embodiment according to figure 6a-7b shall be seen as an example describing a preferred function of the holding element (15).

[0044] The term "lower part of the flexible door screen" should be understood to mean, within the context of this application, any part of the flexible door screen (3) or any part attached to the flexible door screen (3) located in the vicinity of the holding element (15) in at least the closed position of the roller door arrangement (1).

[0045] The term "flexible door screen" should be understood to mean, within the context of this invention, any flat element able to form a closure or a separation and able to roll around an axis or to be folded, intended for closing a bay or an opening.

[0046] The invention shall not be interpreted to only include the above described embodiments, but also combinations of features of the different embodiments forming alternative embodiments.

Claims

1. A method of operating a roller door arrangement (1, 101, 201), said roller door arrangement (1, 101, 201) comprising a flexible door screen (3, 103, 203) movable between a closed position and an open position, and vice versa, and
   a winding roller (5, 105, 205) mounted rotably at the door way for winding and unwinding of the flexible door screen (3, 103, 203), wherein said method comprising the steps of:

   bringing the flexible door screen (3, 103, 203) towards a closed condition of said door arrangement (1, 101, 201) by operating the winding roller (5, 105, 205) in a first rotational direction;
   bringing at least a lower part of the flexible door screen (3, 103, 203) into a condition held by a holding element (15, 115, 215), relatively to a fix structure (13, 113, 213) surrounding the roller door arrangement (1, 101, 201);
   stretching the flexible door screen (3, 103, 203) by a reversing operation of the winding roller (5, 105, 205) in a second rotational direction opposite to the first rotational direction.

2. Method according to claim 1 further comprising the step of: guiding lower bar (27, 127) end portions of the flexible door screen (3, 103, 203) in guides (9, 109, 209).

3. Method according to any one of claims 1-2, comprising the step of: guiding lateral side portions of the flexible door screen (3, 103, 203) in guides (9, 109, 209).

4. Method according to any one of claims 1-3 further comprising the step of: operating the holding element (15, 115, 215) electrically.

5. Method according to any one of claims 1-4, comprising the step of: sensing the torque applied by the winding roller (5, 105, 205) during the stretching

of the flexible door screen (3, 103, 203) in order to provide a predetermined stretching force to the flexible door screen (3, 103, 203).

6. Method according to any one of claims 1-5, comprising the step of: measure the time while the winding roller (5, 105, 205) is reversed in the second rotational direction, during the stretching of the flexible door screen (3, 103, 203), in order to provide a predetermined stretching force to the flexible door screen (3, 103, 203).

7. Method according to any one of claims 1-6, comprising the step of: sensing the wind load applied to the flexible door screen (3, 103, 203) in order to adjust the stretch of the flexible door screen (3, 103, 203) by either operating the winding roller (5, 105, 205) in the first rotational direction, to decrease the stretch, or operating the winding roller (5, 105, 205) in the second rotational direction, to increase the stretch.

8. Method according to any one of claims 1-7 comprising the step of: effecting the holding of at least a lower part of the flexible door screen (3, 103, 203) by an initial reversing operation.

9. Method according to any one of claims 1-8 comprising the step of: releasing the holding of the flexible door screen (3, 103, 203) by initiating an opening movement.

10. Method according to any one of claims 1-9 comprising the step of: effecting the holding element by a solenoid (31) for operation between an engaged condition and a disengaged condition of the flexible door screen (3, 103, 203).

11. Method according to any one of claims 1-10, wherein the step of holding the at least lower part of the flexible door screen (3, 103, 203) is achieved by holding a substantially rigid lower bar (27, 127).

12. Method according to any one of claims 1-10, wherein the step of holding the at least lower part of the flexible door screen (3, 103, 203) is achieved by holding a substantially flexible lower bar (27, 127).

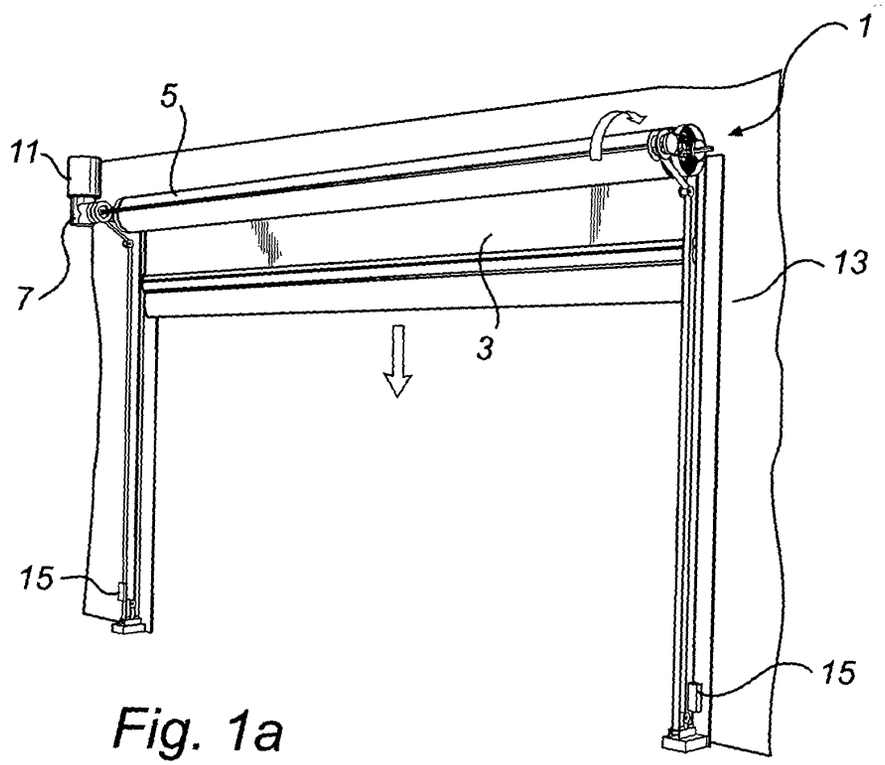

Fig. 1a

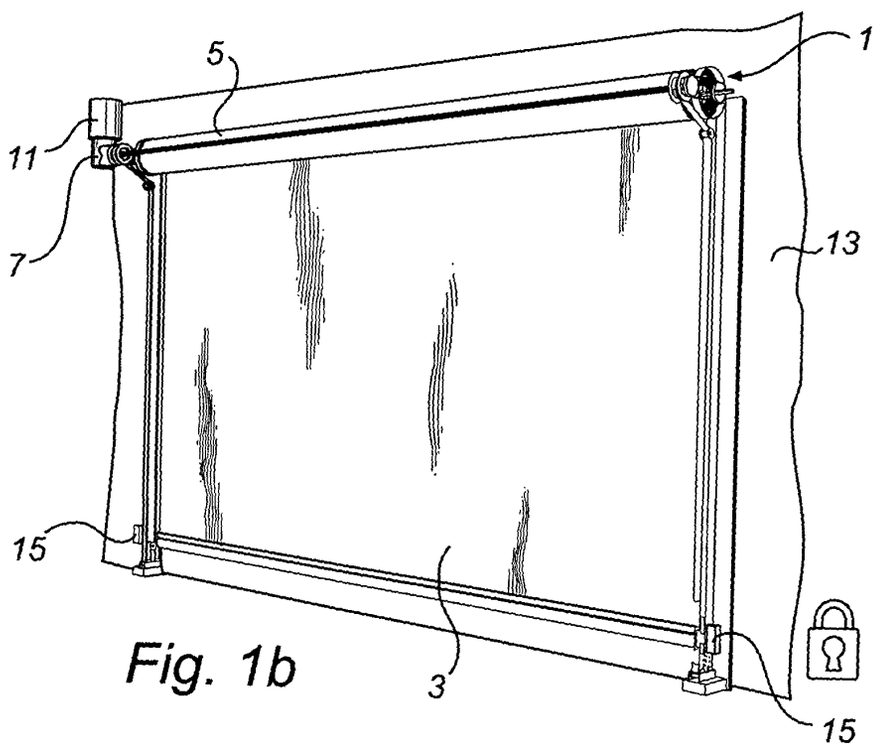

Fig. 1b

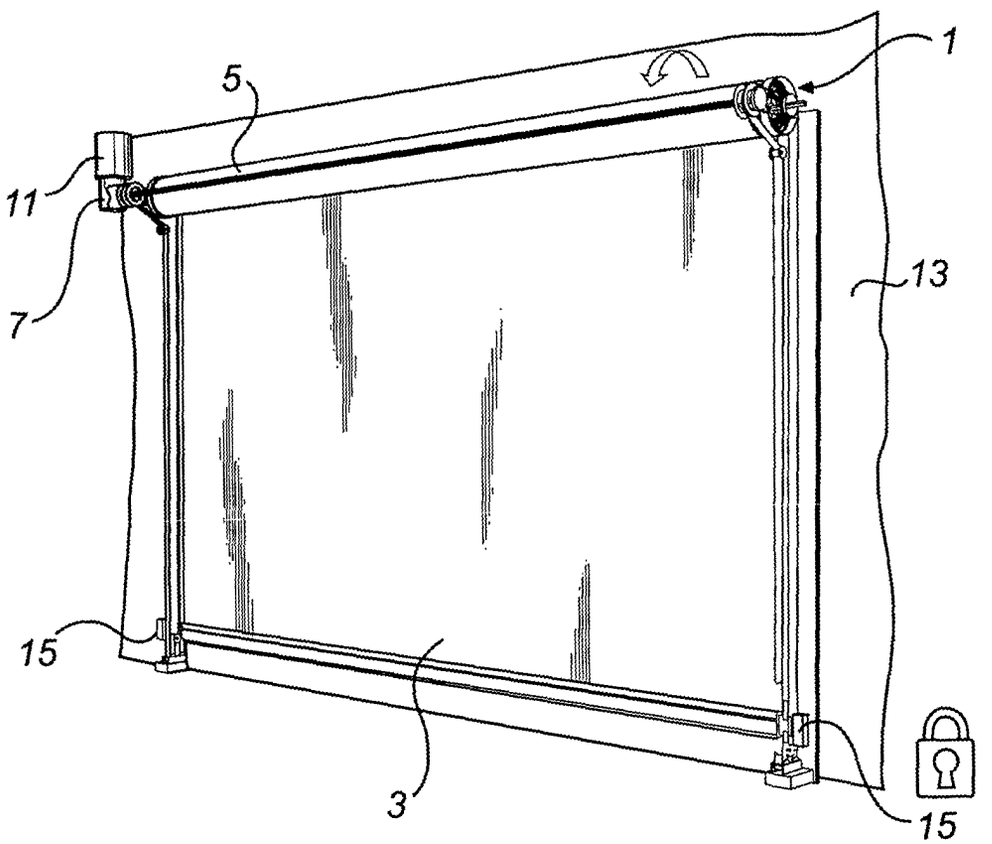

Fig. 1c

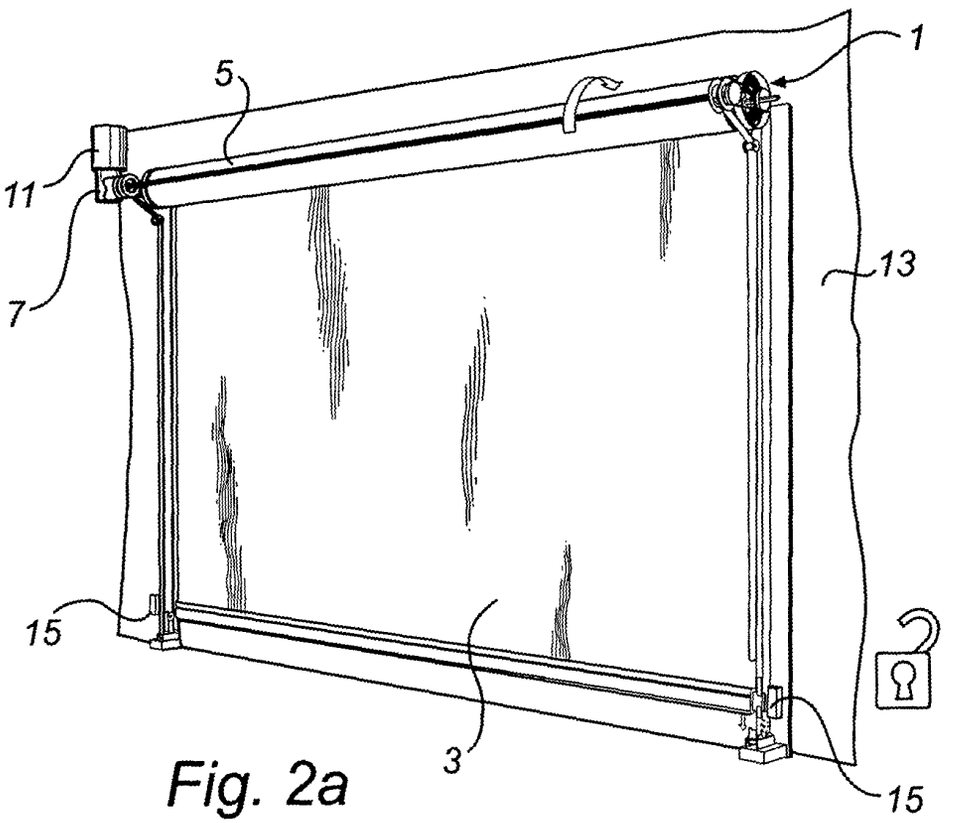

Fig. 2a

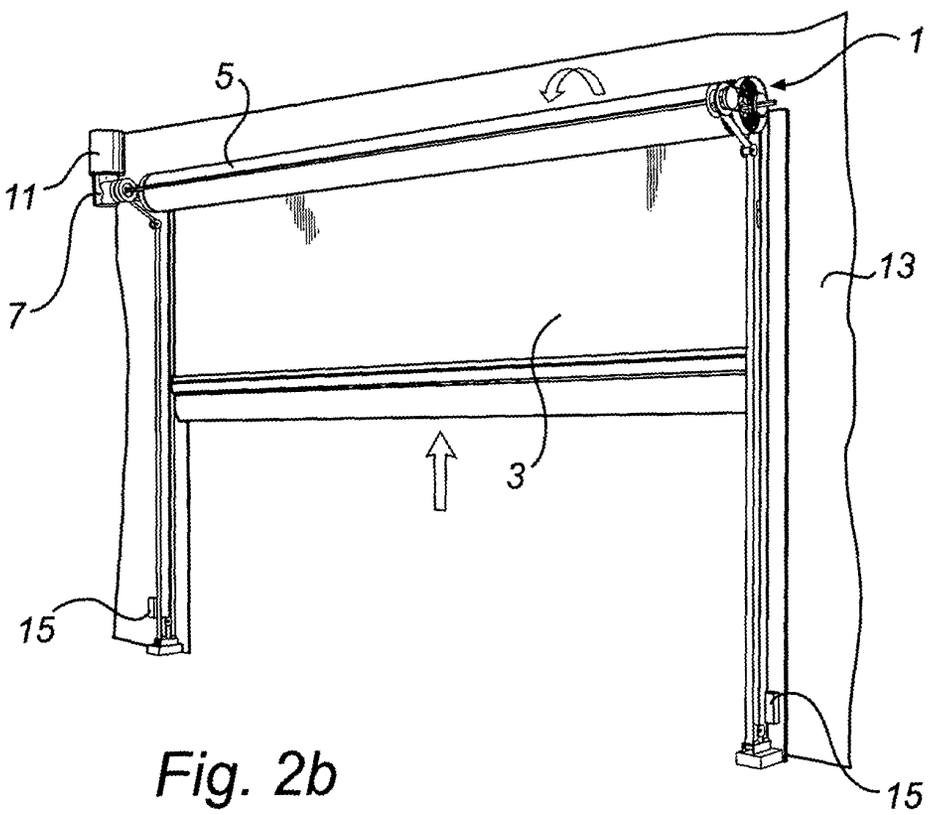

Fig. 2b

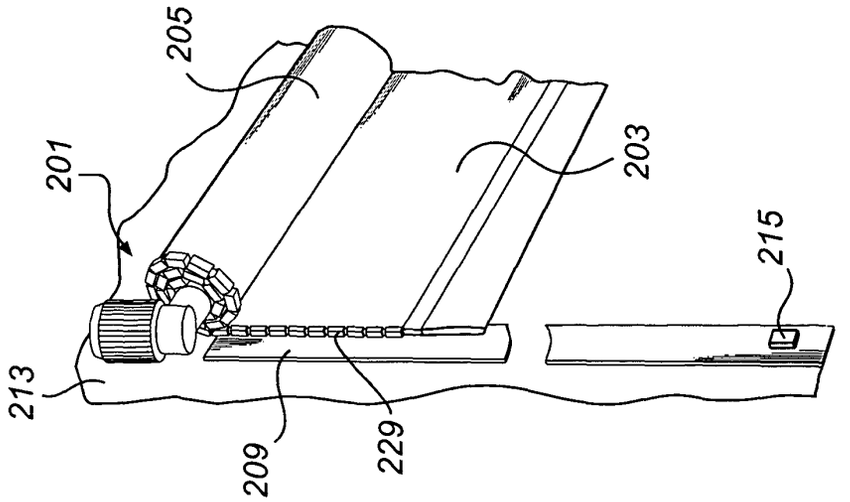

Fig. 5

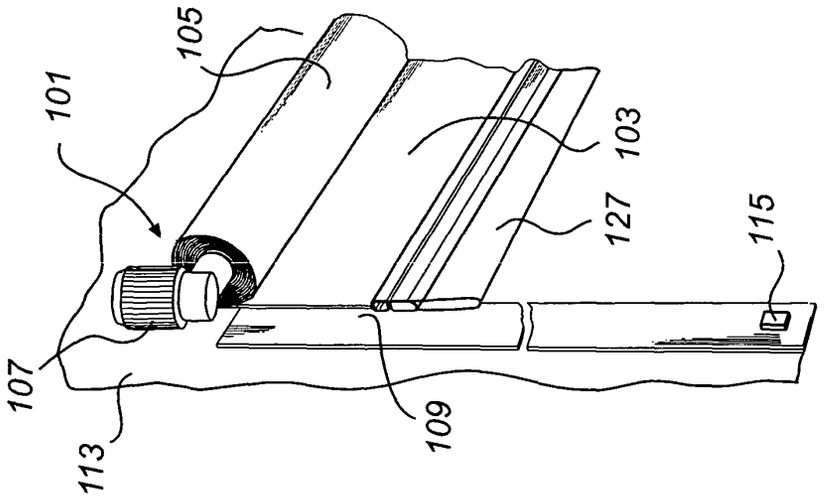

Fig. 4

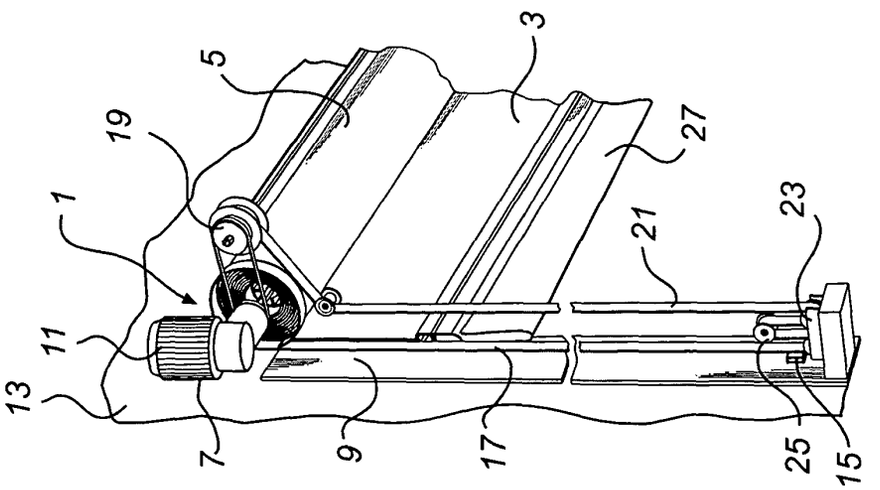

Fig. 3

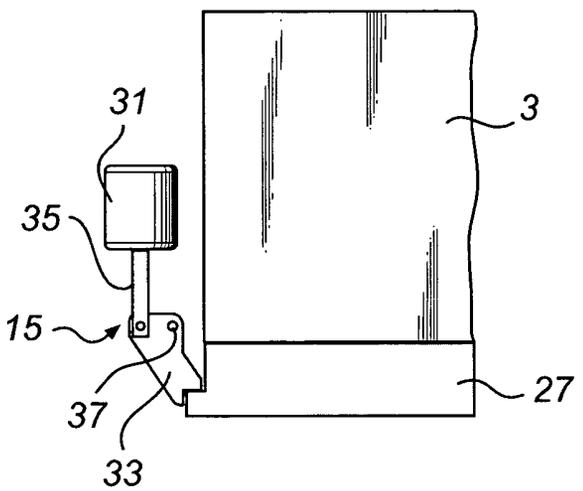

Fig. 6a

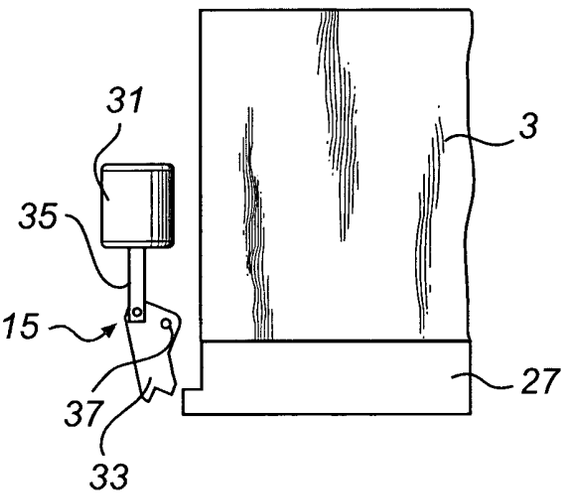

Fig. 6b

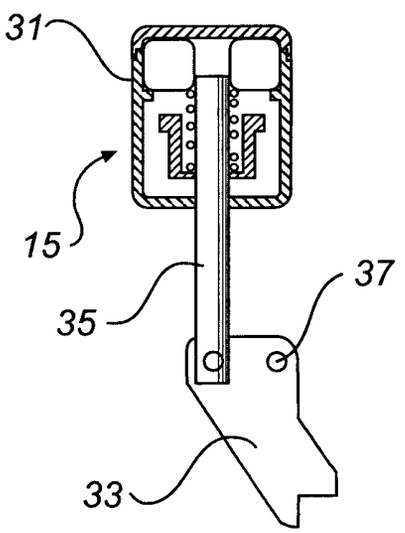

Fig. 7a

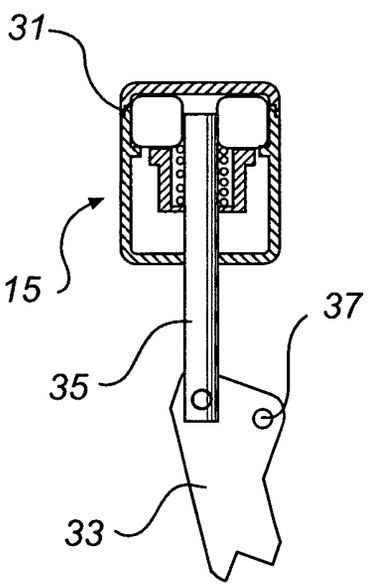

Fig. 7b

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 01 1530

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

E06B
E04F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 October 2004	Merz, W

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 01 1530

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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