

(19)



(11)

EP 4 397 835 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

10.07.2024 Bulletin 2024/28

(51) International Patent Classification (IPC):

E06B 9/15 (2006.01)**E06B 9/17** (2006.01)**E06B 9/70** (2006.01)**E06B 9/174** (2006.01)(21) Application number: **23020574.2**

(52) Cooperative Patent Classification (CPC):

E06B 9/15; E06B 9/17; E06B 9/174; E06B 9/70;**E06B 2009/1743; E06B 2009/2447;****E06B 2009/2452; E06B 2009/2458; E06B 2009/405**

(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**

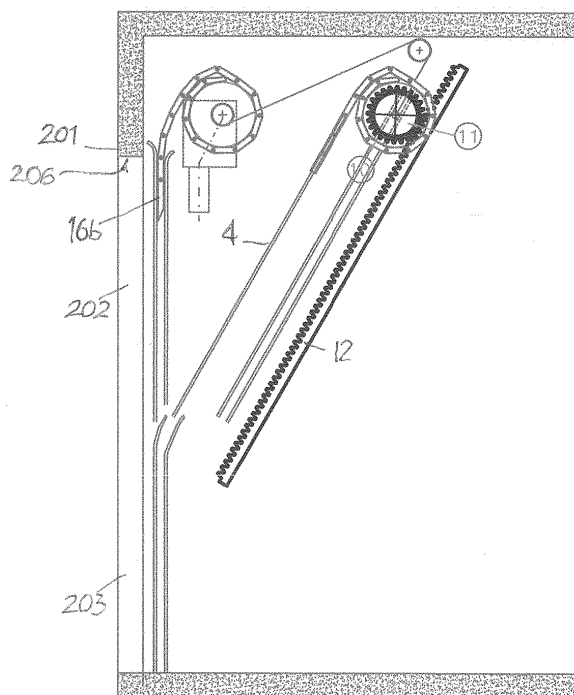
Designated Extension States:

BA

Designated Validation States:

KH MA MD TN(71) Applicant: **Olivero, Stefano****17024 Finale Ligure (IT)**(72) Inventor: **Olivero, Stefano****17024 Finale Ligure (IT)**(74) Representative: **Robba, Pierpaolo****Interpatent S.R.L.****Via Caboto, 35****10129 Torino (IT)**(30) Priority: **27.12.2022 IT 202200021780**(54) **ROLLER SHUTTER FOR DOORS**

(57) Roller shutter or closure (100) for doors (200), the shutter (100) being provided with a first shaft (10) rotating around a respective first axis (X) of horizontal rotation, with a first plurality of closing sections (2a) connected to the first rotating shaft (10) and, in series, with each other, of two lateral vertical guides (1a) arranged, in a fixed position, by opposite bands of the door (200) and slidably engaged by the first plurality of sections closing section (2a), and of a motor (M) driving the first rotating shaft (10) to rotate the first rotating shaft (10) itself around its own rotation axis (X) and imparting closing sections to the first plurality (2a) a first translation motion along the two lateral vertical guides (1a); two further lateral guides (9) being provided and being engaged by the rotating shaft (10) to allow a translation of the rotating shaft (10) itself and of the first axis (X) of horizontal rotation parallel to themselves along the further guides (9) themselves in such a way as to impart to the first plurality of closing elements (2a) a second translation motion along the two lateral vertical guides (1a) overlapping the first translation motion so as to move the first plurality of closing sections (2a) at a speed composed of the effect of the first and second translation motions.

**Fig. 4****EP 4 397 835 A1**

Description

Technical Sector of Invention

[0001] The present invention relates to a roller shutter for doors.

Known technique

[0002] Roller shutters, also known as roller shutters, known and widely used for closing doors, are made up of elements, linked together by hinges, called slats or slats or sections (which we will call "sections" in the following), sliding on vertical guides arranged in correspondence with two uprights of the door, and are essentially characterized by the fact that the aforementioned sections in the opening phase of the door, or in the phase in which these sections free the door space, are recalled upwards, thanks to the winding of the sections themselves on a rotating shaft or roller or drum (which in the following we will call "shaft") with a fixed rotation axis, and they are collected substantially above a crosspiece of the door.

[0003] The rolling shutters currently available are made for civil and industrial use, and take on very different dimensions and technical characteristics, without prejudice to the operating principle described above.

[0004] If, then, the door is of considerable size, especially in height, as, for example, in the doors of industrial warehouses, the roller shutter described above is also usually equipped with electric motors, to carry out the opening and closing movements.

[0005] Again in the industrial sector, in order to limit energy losses caused by heat dispersion between internal and external environments, as well as to free up the door space in the shortest possible time to allow both pedestrian and vehicular transit, it is necessary that the opening and closing speeds are quite high: with the electric motors mentioned above, speeds of 1 meter per second, or slightly higher, are normally achieved, which are normally not sufficient to quickly free or close the door compartment.

[0006] Two binding factors essentially contribute to limiting the opening and closing speeds: the first factor is linked to the winding and unwinding of the sections which on the rotating shaft must be regular and with mechanical stresses of the constraints between sections of a limited extent; the second factor concerns the acceleration and braking that must be imparted to the assembly made up of the rotating shaft and the sections that progressively wrap around the rotating shaft itself: this assembly can not only take on progressively more and more significant mass and diameter, but it also requires the use of increasing powers with quadratic progression related to the speeds.

[0007] Finally, if it is necessary to ventilate the internal environment, the roller shutters of the type described above can only be partially rolled up, creating only a par-

tial opening of the door compartment only between the floor and a lower edge of the roller shutter itself, also cease the security barrier effect against the possibility of intrusions.

[0008] In summary: the main drawbacks presented by known types of roller shutters are the limited opening and closing speeds, as well as the impossibility of opening only the upper part of the door compartment in order to allow ventilation of the internal environments without however affecting the safety barrier function of the roller shutter itself. To these drawbacks, there is also the bulk in the upper area of the door or immediately above the door crosspiece, represented by the set of sections progressively wrapped around the rotating shaft, which, in the case of doors of considerable height, it can reach quite large dimensions and therefore require the adoption of even larger collection boxes, with the possible need to either raise the ceiling more, or even sacrifice part of the door space.

Summary of the Invention

[0009] The aim of the present invention is to create a shutter or roller shutter for doors which is free from the drawbacks described above.

[0010] According to the present invention, a shutter or roller shutter for doors is created, the shutter comprising:

- a first shaft rotating around a respective first horizontal rotation axis,
- a first plurality of closing sections connected to the first rotating shaft and, in series, to each other,
- two lateral vertical guides arranged, in a fixed position, on opposite sides of the door and slidably engaged by the first plurality of closing sections, and
- a drive motor for the first rotating shaft to rotate the first rotating shaft itself around its own rotation axis and impart a first translation motion along the two lateral vertical guides to the first plurality of closing sections; the roller shutter for doors being characterized by the fact of comprising two further lateral guides engaged by the rotating shaft to allow a translation of the rotating shaft itself and of the first horizontal rotation axis parallel to themselves along the further lateral guides themselves in such a way as to imparting to the first plurality of closing sections a second translation motion along the two lateral vertical guides overlapping the first translation motion so as to move the first plurality of closing sections at a speed composed of the superposition of the first and second translation motion .

[0011] So, for example, once the rotation speed of the shaft is fixed at the usual values which corresponds to a peripheral speed of 1 meter per second, by carrying out a translation of the shaft at one meter per second we will obtain an opening at substantially double the speed without putting more stress on the rotating section system,

i.e. the rotating shaft.

[0012] According to the present invention, a roller shutter or roller shutter for doors is preferably made which also includes:

- a second shaft rotating around a respective second horizontal rotation axis;
- a second plurality of closing sections connected to the second rotating shaft and, in series, to each other; and
- two further lateral vertical guides arranged, in a fixed position, on opposite sides of the door and slidably engaged by the respective second plurality of closing sections; the two further lateral vertical guides being arranged from opposite bands of an upper part of the door, vertically aligned with the lateral vertical guides arranged from opposite bands of a lower part of the door.

Brief Description of the Drawings

[0013] The invention will now be described with reference to the attached drawings, which illustrate an example of non-limiting implementation, in which:

- figure 1 illustrates, schematically and in front elevation, a preferred embodiment of a roller shutter for doors made according to the dictates of the present invention;
- figure 2 illustrates a section along line A-A of the roller shutter of figure 1, in which the roller shutter is arranged in an operational configuration of complete closure of the door;
- figure 3 illustrates, again in section, the roller shutter for doors of figure 2, but arranged in an operational configuration of partial opening of the door; and
- figure 4 illustrates, again in section, the roller shutter for doors of figure 2, but arranged in an operational configuration of total opening of the door.

Detailed Description

[0014] With reference to figures 1 and 2, 100 indicates as a whole a rolling shutter, or rolling closure, for a door 200, which is a door 200 of a preferably, but not necessarily, industrial type, or having considerable dimensions, especially in height, and to which the following description will make explicit reference without losing any generality.

[0015] The door 200 is substantially defined by an upper crosspiece 201, and by two vertical lateral uprights 204 which, starting from a floor 205, are inserted into the crosspiece 201, defining between them and with the crosspiece 201 itself, a space 206 for both pedestrian and pedestrian transit, both vehicular.

[0016] The 100 roller shutter includes:

- a shaft 10 rotating around a respective X axis of hor-

izontal rotation,

- a plurality of closing sections 2a, also called slats, or slats, which are arranged parallel to the X axis, they are constrained both in series with each other by means of respective constraints 3, i.e. elements similar to hinges, and at one end of the series to the rotating shaft 10;
- two lateral vertical guides 1a, which are arranged, in a fixed position, on opposite sides of the door 200 in correspondence with the uprights 204 and are slidably engaged by the plurality of closing sections 2a, and
- a motor M for driving the rotating shaft 10 to operate, as will be better described below, the rotating shaft 10 itself around its rotation axis two lateral vertical guides 1a.

[0017] In particular, the two lateral vertical guides 1a run parallel to the uprights 204 of the door 200 starting from the floor 205 without, however, reaching the crossbar 201 of the door 200 itself, and, in fact, define:

- a lower part 203 of the compartment 206 of the door 200, suitable for both pedestrian and vehicular transit, even if for vehicles of small dimensions, and such as not to occupy the entire compartment 206 in height as they pass; and
- an upper part 202 of the compartment 206 of the door 200 suitable, together with the lower part 203, for the vehicular transit of vehicles of such dimensions as to occupy almost the entire compartment 206 in height as they pass.

[0018] In order to speed up the opening of the compartment 206 of the door 200, even halving the opening time compared to traditional closing systems without, however, excessively stressing the rotating shaft 10, the roller shutter 100 includes two further lateral guides 9, only one of which is illustrated in figure 2, engaged by the rotating shaft 10 to allow a translation of the rotating shaft 10 and the X axis parallel to themselves precisely along the two further lateral guides 9 in such a way as to impart to the plurality of closing sections 2a a second translation motion along the two vertical lateral guides 1a overlapping the first translation motion so as to move the closing sections 2a at a speed composed of the effect of the first and second translation motions.

[0019] The two further lateral guides 9 are engaged by respective opposite ends 10a of the rotating shaft 10, and are inclined both with respect to the vertical and with respect to the guides 1a since they are arranged, in their lowest part, substantially in proximity to the compartment 206 of the door 200, and, in their highest part, in a position further away from the space 206 of the door 200, and substantially at the same height as the crossbar 201 of the door 200.

[0020] The simple translation of the rotating shaft 10, parallel to itself and without any rotation around its own

X axis, allows the closing sections 2a to be dragged along the guides 1a, freeing the lower part 203 of the compartment 206 from the closing sections 2a themselves, and the inclination of the lateral guides 9 in itself already allows this operation to be carried out in less time than that required for a traditional roller shutter whose sections are movable only vertically. Combining this simple translation of the shaft 10 rotating parallel to itself with the rotation of the shaft 10 (rotating around its own X axis), the opening time, or closing time, is significantly reduced, because while the closing sections 2a wrap around the rotating shaft 10, they are also simultaneously dragged along the guides 9 with the result that the movement of the closing sections 2a along the guides 1a is decidedly faster, up to double the known speeds current.

[0021] For the purposes of combining the first translation motion of the closing sections 2a due to their wrapping around the rotating shaft 10, with the second translation motion of the closing sections 2a themselves, due to the mere translation of the X axis and shaft 10 rotating parallel to itself, the rolling shutter 100 also includes a linear rack 12 fixed and arranged parallel to one of the two guides 9, and a toothed wheel 13 angularly integral with the rotating shaft 10 and meshed in the linear rack 12 to form a gear 11 which rotates the rotating shaft 10 around its own axis X during the translation of the X axis, and of the rotating shaft 10 itself by means of the motor M, along the further lateral guides.

[0022] As the shaft 10 translates along the guides 9 parallel to itself, and also rotates around its own X axis going up along the relevant guides 9, not only does it also bring with it the 2a closing sections, but determines the wrapping on itself of the closing sections 2a themselves, thus realizing, the composition of the first movement and the second translation along the guides 1a to the advantage of a reduced, if not even halved, opening time of the door 200 compared to traditional systems.

[0023] In order not to overly stress the rotating shaft 10 during its rotation around the X axis during the consequent winding of the closing sections 2a around itself, the rolling shutter 100 also includes two subvertical guides 4 - only one of which is illustrated in figure 2 - arranged, in a fixed position, by opposite bands of the door 200 in a substantially contiguous and continuous manner to the two guides 1a, and slidably engaged by the plurality of closing sections 2a to guide and support the closing sections 2a.

[0024] The two subvertical guides 4 are located in a position above the relative guides 9a, with respect to the vertical of the door 200, parallel to the rack 12, and are also arranged in substantial continuity with the relative guides 9a in order to accommodate, albeit temporarily, the closing sections 2a when these, as a result of their wrapping around the rotating shaft 10 and their removal from the door 200, disengage from the guides 9a and progressively wrap around the rotating shaft 10 itself, progressively abandoning the guides 4 themselves.

[0025] In the non-limiting example of implementation

of the roller shutter 100 illustrated and described here, the movement of the rotating shaft 10 by the motor M is achieved by means of a pulley - indicated as a whole with 14 and also forming part of the shutter or closure 100 - including:

- one or more ropes or belts 7 suitable for moving (lifting and releasing) the rotating shaft 10,
- a pulley 8 for returning the belts or ropes 7 to achieve the correct winding and recall or release of the rotating shaft 10, and
- a drum 5 with a fixed rotation Y axis suitable for winding the belts or straps 7.

[0026] In particular, the drum 5 is arranged, in a fixed position, directly above the upper crosspiece 201 of the door 200 with its Y axis parallel to the upper crosspiece 201 of the door 200 itself, and the pulley 8 is arranged at an upper end of the fixed linear rack 12. The ropes or belts 7 are connected at one end to the drum 5, are returned by the pulley 8, and are also connected to the shaft 10: the rotation of the drum 5, achieved by the drive of the motor M, determines the winding, i.e. the unwinding of the ropes or belts 7 on it and the recall, or release, of the rotating shaft 10, which, being constrained to translate with its own axis The X axis itself, thanks to the gear 11, wraps, or releases, the closing sections 2a, simultaneously moving them along the guides 9.

[0027] Since, as previously written, the rolling shutter 100 is suitable for a door 200 of a preferably, but not necessarily, industrial type, i.e. having considerable dimensions, especially in height, the closing sections 2a described above are not sufficient to completely cover the entire compartment 206 of the door 200, but only its lower part 203, therefore, the rolling shutter 100 also includes a second shaft 6 rotating around the Y axis of horizontal rotation, and angularly integral, also selectively, with drum 5; and a second plurality of closing sections, indicated with 2b, also called slats or slats, which are arranged parallel to the Y axis, are connected in series with each other by means of respective constraints 3, or elements similar to hinges, and are connected at one end of the series to the rotating shaft 6. The rolling shutter 100 also includes two further lateral vertical guides 1b arranged, in a fixed position, on opposite sides of the door 200 parallel to the uprights 204 and in correspondence with the upper part 202. The two further lateral vertical guides 1b are vertically aligned with the guides 1a vertical laterals and are slidably engaged by the respective plurality of the closing elements 2b.

[0028] In particular, the two vertical guides 1a present, in correspondence with the two further vertical guides 1b, an upper terminal part 15 curved towards the inside of the door 200 and substantially overlapped with an initial lower part 16 of the two further vertical guides 1b in such a way to allow the closing sections 2a and 2b to define a seamless barrier along the entire compartment 206. The curved upper terminal part 15, moreover, is also di-

rected towards the subvertical guides 4 to guarantee both a regular transition of the closing sections closure 2a from the guides 1a to the subvertical guides 4, is an overlap of a lower closure section 16b of the closure sections 2b with the closure sections 2a.

[0029] Since the second rotating shaft 6 is angularly integral, although also selectively, with the drum 5, the rotation of this drum 5, achieved by the drive of the motor M, determines not only the winding, or unwinding, on it of the ropes or belts 7 and the recall, or release, of the rotating shaft 10 along the guides 9, but also the rotation around the Y axis of the rotating shaft 6 itself and the recall, or release, of the second plurality of closing sections 2b along the two further lateral vertical guides 1b.

[0030] In other words, starting from an operational configuration of complete closure of the door 200, illustrated in figure 2, in which the closing sections 2a are arranged along the guides 1a to completely close the lower part 203 of the compartment 206, and the closing sections 2b are arranged along the guides 1b to completely close the upper part 202 of the compartment 206, the activation of the motor M determines the simultaneous rotation of the shafts 10 and 6 rotating around their axes 2b in an operational configuration of partial opening of the door 200, illustrated in figure 3, where the two further lateral vertical guides 1b are still engaged by the closing sections 2b, while the vertical guides 1a are already free from the relative closing sections 2a, and where a lower closing section 15a of the closing sections 2a is arranged substantially exiting the curved upper end part 15 of the guides 1a.

[0031] The further, or continuous, operation of the motor M determines the further rotation of the rotating shafts 10 and 6 around their own axes 2a will slide along the guides 4, simultaneously wrapping around the drive shaft 10, the closing sections 2b will almost completely free the guides 1b allowing the total opening of the compartment 206 of the door 200, as shown in figure 4, which illustrates an operational configuration of total opening of the door 200 in which the lower closing section 16b of the closing sections 2b is arranged substantially in proximity to the crosspiece 201 of the door 200, and the rotating shaft 10, with the closing sections 2a wound on it, has reached the highest position of the rack 12 and no longer represents any obstacle to entry/exit through the compartment 206 of the door 200.

[0032] By adopting for the upper part 202 of the compartment 206 of the door 200 closing sections 2b controlled by a simply rotating shaft 6, i.e., essentially, a traditional roller closure, and for the lower part 203, closing sections 2a controlled by a shaft 10 rotating around a respective X axis of horizontal rotation and translating during its rotation along the subvertical guides 9 it will always be possible to obtain an advantage in terms of opening and/or closing speed, to which will be added the possible independently open the two parts 202 and 203 allowing, in the case of opening only the upper part 202, to obtain ventilation of the internal environments without

granting pedestrian access. To open only the upper part 202, while the lower part 203 remains closed, it is necessary to provide a transmission, known and not illustrated and connected to the drum 5, such as to decouple the drum 5 itself from the rotating shaft 6, thus making the pulley 14 idle to the rotation of the rotating shaft 6 itself.

[0033] In any case, thanks to the composition of the two motions (rotational and translational), the compartment 206 of the door 200 is freed in much shorter times than similar doors equipped with simple fixed-axis winders and also compared to similar so-called sectional doors equipped with linear motion only.

[0034] The closing sections 2a and 2b, once collected on the respective rotating shafts 10 and 6, will take on a smaller size than the size that would exist if all the closing sections 2a and 2b necessary to completely close the compartment 206 were wrapped around a single rotating shaft as happens in the embodiments known to date, and, furthermore, the overall height above the crosspiece 201 of the door 200 will also be significantly reduced compared to a rolling shutter for doors with a single rotating shaft.

[0035] No restrictions are placed on the choice of materials constituting the invention.

[0036] According to a further embodiment not illustrated, but easily deduced from what has been described above, the movement of the closing sections 2a, i.e. the rotation of the rotating shaft 10, can be carried out independently from the movement of the closing sections 2b, i.e. the rotation of the rotary shaft 6, preferably adopting a drive motor M for each rotary shaft 6 and 10 independent of the drive motor M of the other rotary shaft 10 and 6. Two independent motors M, one for each shaft 10 and 6 rotating, they allow not only to divide the electro-mechanical power, which is not possibly possible for a shutter or roller shutter for doors with a single rotating shaft, but they also allow not only to do without the aforementioned transmission, but also to open only the upper part 202 of the door 200 allowing ventilation and preventing pedestrian or vehicle access.

[0037] In the attached figures one of the possible geometries has been represented, simplifying the representation as much as possible, omitting components and devices belonging to the known art (such as for example weight balancing systems, safety systems, electrical and electronic accessory systems), as they it is considered not strictly necessary to report more details, this to facilitate understanding of the functioning of the invention.

[0038] In order to ensure full compliance with sector standards and CE standards, the invention in its various construction forms must obviously be subjected to testing and approval.

[0039] In addition to the embodiment of the invention, as described above, it should be understood that numerous other variations exist. It should also be understood that such embodiments are exemplary only and do not limit either the scope of the invention, its applications, or

its possible configurations. On the contrary, although the above description allows the specialized technician to implement the present invention at least according to one of its exemplary embodiments, it must be understood that many variations of the described components are possible, without thereby departing from the scope of the invention, as defined in the attached claims, which are interpreted literally and/or according to their legal equivalents.

List of components

[0040]

1a and 1b - Vertical guides
 2a and 2b - closing sections, also called slats or slats
 3 - Constraints between closing sections
 4 - Subvertical guides
 5 - Drum
 6 - Rotating shaft with fixed rotation axis
 7 - Suitable ropes or straps
 8 - Pulleys
 9 - Rotating and translating shaft guides;
 10 - Rotating and translating shaft;
 10a - Opposite ends of rotating shaft 10
 11 - Gear
 12 - Fixed rack
 13 - Toothed wheel integral with the rotating and translating shaft;
 14 - Pulley
 15 - Curved upper end part 15 of the guides 1a
 15a - Lower closing section 15a of the closing sections 1a
 16 - Lower initial part 16 of the guides 1b
 16b - Lower closing section 16b of closing sections 2b
 200 - Door
 201 - Upper crosspiece of the door
 202 - Upper part of the door
 203 - Lower part of the door
 204 - Door uprights
 205 - Floor
 206 - Transit compartment
 M - Electric gear motor

Claims

1. Roller shutter (100) for doors (200), the shutter (100) comprising:
 - a first shaft (10) rotating around a respective first axis (X) of horizontal rotation,
 - a first plurality of closing sections (2a) connected to the first rotating shaft (10) and, in series, with each other,
 - two lateral vertical guides (1a) arranged, in a fixed position, on opposite sides of the door

(200) and slidably engaged by the first plurality of closing sections (2a), and

- a motor (M) for driving the first rotating shaft (10) to rotate the first rotating shaft (10) itself around its own rotation axis (X) and impart to the first plurality of closing sections (2a) a first motion of translation along the two lateral vertical guides (1a);

the roller shutter (100) for doors (200) is **characterized by** the fact that it includes two further lateral guides (9) engaged by the rotating shaft (10) to allow a translation of the rotating shaft (10) itself and of the first axis(X) of horizontal rotation parallel to themselves along the further lateral guides (9) themselves in such a way as to impart to the first plurality of closing sections (2a), a second translation motion along the two lateral vertical guides (1a) overlapping the first translation motion so as to move the first plurality of closing sections (2a), at a speed composed of the superposition of the first and second translation motion.

2. Roller shutter for doors **characterized by** the fact that it includes a gear (11) for controlling the first rotating shaft (10) comprising, in turn, a fixed linear rack (12) arranged parallel to one of the two guides (9), and a toothed wheel (13) angularly integral with the first rotating shaft (10) and meshed in the linear rack (12) to translate the first rotating shaft (10) along the further lateral guides (9) due to the sole effect of the rotation of the first (10) itself rotating around its own axis (X).

3. Roller shutter for doors **characterized by** the fact that the further lateral guides (9) are inclined and are arranged substantially close to the door (200) in their lower part, and in a position further away from the door (200) in their highest.

4. Roller shutter for doors according to any of the previous claims, **characterized in that** it also comprises:

- a second shaft (6) rotating around a respective second axis (Y) of horizontal rotation;
- a second plurality of closing sections (2b), connected to the second rotating shaft (6) and, in series, with each other; and
- two further lateral vertical guides (1b) arranged, in a fixed position, on opposite sides of the door (200) and slidably engaged by the respective second plurality of the closing sections (2b); the two further lateral vertical guides (1b) being arranged from opposite bands of an upper part (202) of the door (200), vertically aligned to the lateral vertical guides (1a) arranged from opposite bands of a lower part (203) of the door (200).

5. Roller shutter for doors according to claim 4, **characterized in that** it comprises a drive motor (M) for each rotating shaft (10)(6) independent of the drive motor (M) of the other shaft (6)(10) rotating to allow the electro-mechanical power to be divided. 5
6. Roller shutter for doors according to claim 4, **characterized in that** it comprises a drive motor (M) for each rotating shaft (10)(6) independent of the drive motor (M) of the other shaft (6)(10) rotating to allow the opening of the compartment (201) of the door (200) to be divided between its upper part (202) and its lower part (203). 10

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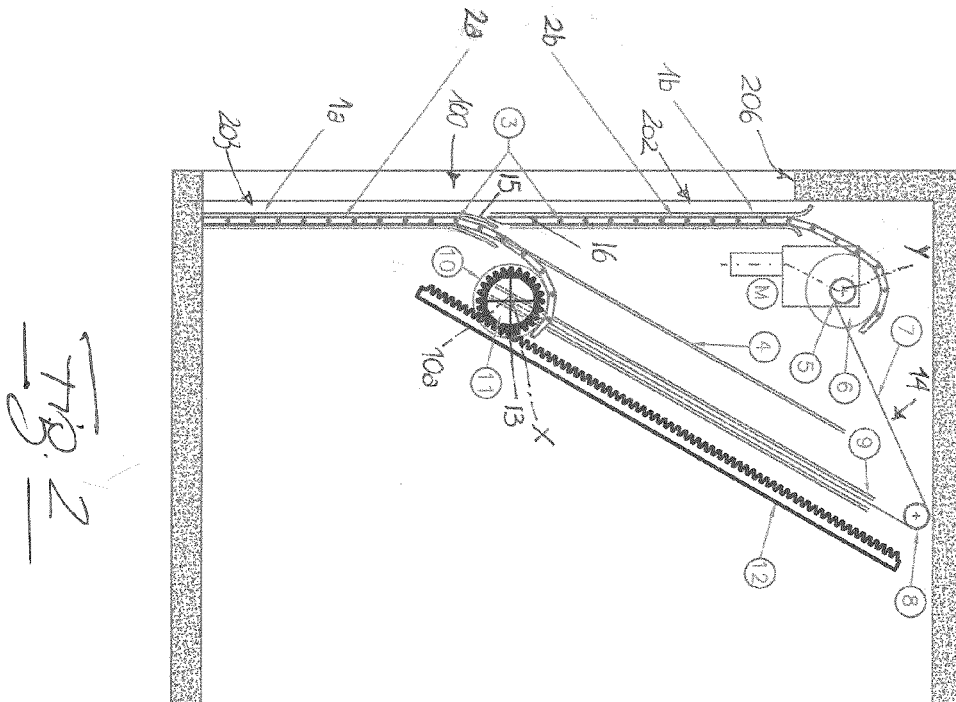
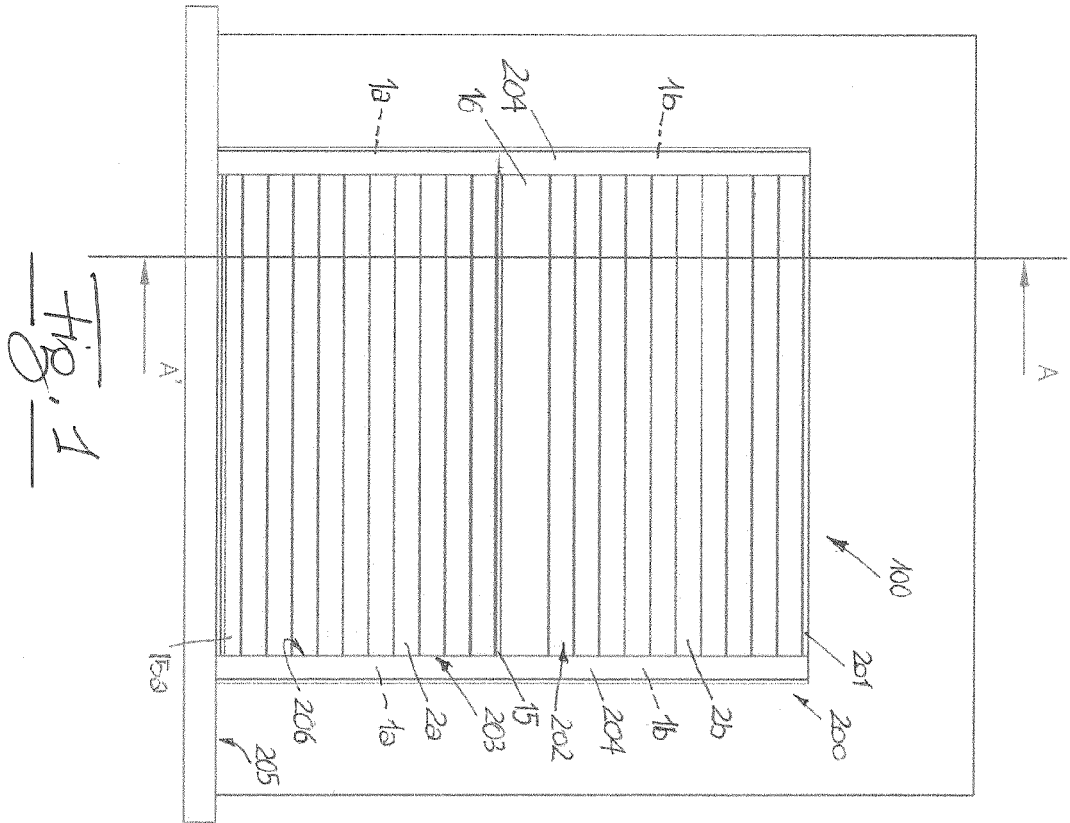
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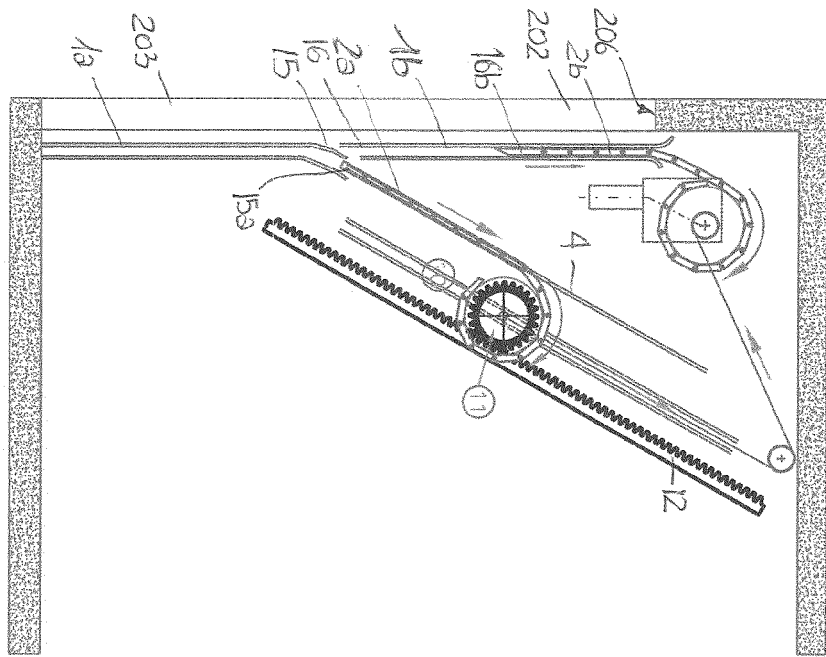
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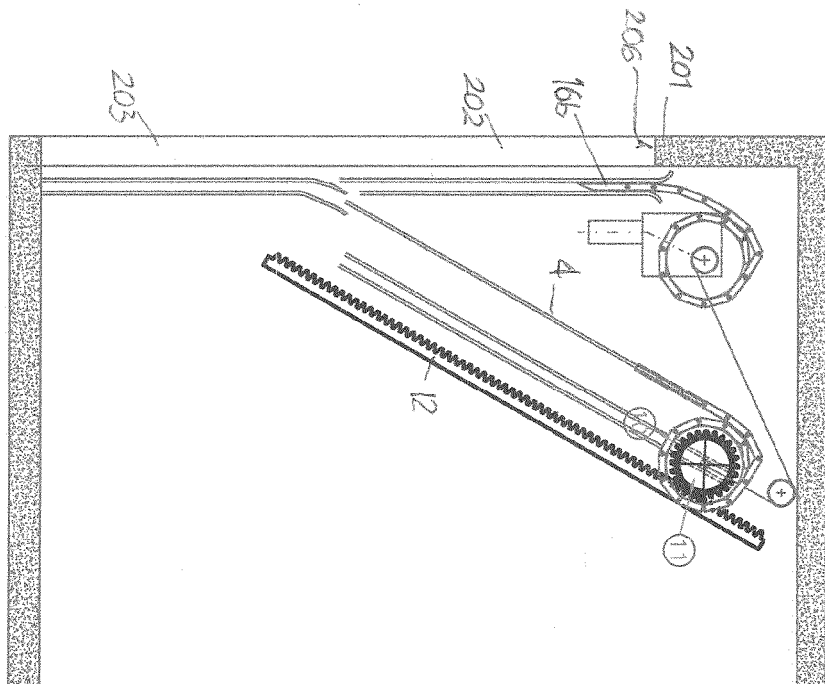


Fig. 4



EUROPEAN SEARCH REPORT

Application Number

EP 23 02 0574

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 May 2024	Examiner Kofoed, Peter
CATEGORY OF CITED DOCUMENTS			
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		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	

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