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(71) Applicant: VIITAMÄKI, Tapio SF-61330 Koskenkorva (FI)

(72) Inventor: Viitamäki, Tapio 61330 Koskenkorva (FI)

 (74) Representative: Savolainen, Seppo Kalevi et al Oy Kolster Ab, Iso Roobertinkatu 23, P.O. Box 148
 00121 Helsinki (FI)

(54) Turning device for sectional overhead door

(57)The invention relates to a turning device in connection with a laminated lift door comprising horizontal lamellas (1), the door being designated to move by track wheels along tracks provided on the sides of the door, whereby the turning device to be arranged on at least one side of the door comprises a vertical frame (5) to be attached to an edge of an uppermost lamella (1), an articulated arm (6) comprising two articulated arm parts (8, 9) pivotally mounted to each other and allowed to fold in one direction, a first articulated arm part (8) being pivotally mounted to the frame by a first frame joint (10), a turning arm (11) whose one end is pivotally mounted by a second frame joint (12) in the frame underneath the pivoted mounting point (10) of the first articulated arm part (8) while a second end is pivotally mounted in the same axle (19) as a second articulated arm part (9), rotatably with respect to the second articulated arm part (9), a toothed wheel element (13) unturnably attached with respect to the second articulated arm part (9) but turnably attached with respect to the turning arm (11), an uppermost track wheel (3a) designated to move along the track (4) and attached to the same axle (19) as the toothed wheel element (13), and a mechanical control element (14) attached to the curved part (4c) of the track and arranged to be in engagement over a predetermined distance with the toothed wheel element (13) during the beginning of an opening position and the end of a closing position of the door, whereby, when the door is opened, the mechanical control element (14) turns the toothed wheel element (13) and thus also the articulated arm parts (8, 9) towards each other, which forces the uppermost track wheel (3a) and the uppermost lamella (1) closer to each other, thus causing the uppermost lamella to turn.

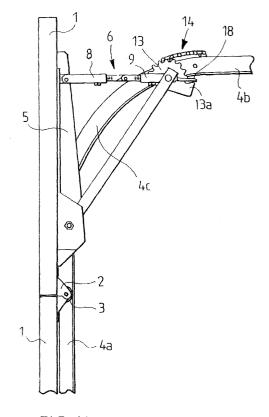


FIG 11a

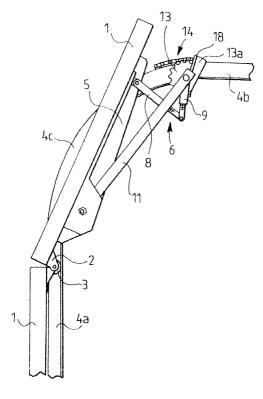
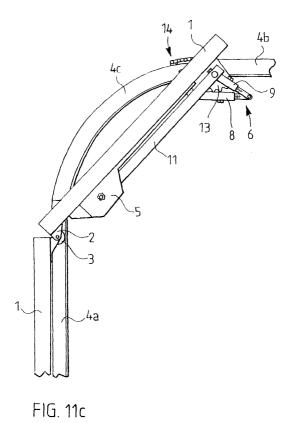


FIG. 11b



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Description

BACKGROUND OF THE INVENTION

[0001] The invention relates to a turning device in connection with a lift door comprising several horizontal lamellas hinged together on top of each other, and track wheels arranged at outermost hinges of the lamellas and at the lower edge of the door designated to move along a track arranged on both sides of the door, each track comprising a vertical part attached to a vertical part of a frame of the door, a horizontal part located substantially at a height of the upper edge of the door, and a curved part connecting the vertical and horizontal parts. Such doors are commonly used as garage doors.

[0002] A common problem with the laminated lift doors has been the large additional vertical space needed in addition to the height of a door to enable the uppermost lamella to turn in a normal operating situation. In order to alleviate this problem, lowering kits whose operation is based on double tracks are available but they must be separately ordered. A common feature of these lowering kits is that they are expensive while the necessary additional space still remains large. All this makes the laminated doors more difficult to sell compared to other door types, particularly when many garages have a problematically low ceiling.

[0003] A solution to these problems is set forth in FI 91986, which discloses a turning device comprising a lever arm element attached to a door and arranged with a bearing in connection with a hinge between two uppermost lamellas coaxially with a track wheel located at the same point, and a mechanical control element immovably arranged in connection with a vertical part of a door frame or a track and arranged to be connected over a predetermined distance with the lever arm element when being close to the beginning of an opening position and the end of a closing position of the door, and a force arm connected between the lever arm element and a fixing arm of the uppermost track wheel, whereby when the door is opened, the mechanical control element turns the lever arm element which, in turn, via the force arm, forces the uppermost track wheel and the uppermost lamella closer to each other, thus causing the uppermost lamella to turn. The lever arm element comprises a toothed wheel and a lever arm unturnably attached in connection with the same, an end of the lever arm being pivotally mounted at the lower end of the force

[0004] The operating principle of the structure described above is the mechanical control of the upper lamella implemented by the uppermost track wheel and forced by the relative movement of the door and the frame structure at the beginning of the lifting movement and at the end of the closing movement of the door. When the door is opened, the turning device forces the upper lamella to turn as soon as the lifting movement has started, and when the door is closed, to take the

same path as when the door was opened, now only in a reverse direction.

[0005] This solution presents the advantage that the vertical additional space needed is no longer important because only a small fraction of the earlier necessary additional space will be needed.

[0006] A problem with this basically successful solution is, however, that it is difficult to install since the device is not an entirely integrated whole, which means that all attachment points therein must be found by experimenting. Furthermore, when carelessly used, the toothed wheel/mechanical control system exposed to a user's hands is dangerous if e.g. fingers or pieces of clothing get caught therein. The force needed for operating the device is also found to be relatively high.

SUMMARY OF THE INVENTION

[0007] An object of the present invention is to improve the prior art turning device based on the above-described mechanical control. The object is achieved by a mechanical control device of the invention, which is characterized in that the turning device to be arranged at least on one side of the door comprises:

a vertical frame to be attached to an edge of an uppermost lamella,

an articulated arm comprising two articulated arm parts pivotally mounted to each other by a folding joint such that the articulated arm parts are allowed to fold around said joint in one direction towards each other, a first articulated arm part being pivotally mounted to the frame by a first frame joint,

a turning arm whose one end is pivotally mounted by a second frame joint at a distance in the frame underneath the pivoted mounting point of the first articulated arm part while a second end is pivotally mounted in the same axle as a second articulated arm part, rotatably with respect to the second articulated arm part,

a toothed wheel element unturnably attached with respect to the second articulated arm part but turnably attached with respect to the turning arm,

an uppermost track wheel to move along the track, attached to the same axle as the toothed wheel element, and

a mechanical control element attached to the zone of the curved part of the track and arranged to be connected over a predetermined distance with the toothed wheel element when being close to the beginning of an opening position and the end of a closing position of the door, whereby, when the door is opened, the mechanical control element turns the toothed wheel element and thus also the articulated arm parts towards each other, which forces the uppermost track wheel and the uppermost lamella closer to each other, thus causing the uppermost lamella to turn.

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[0008] The turning device of the invention is an entirely independent device which is easy to attach by its frame to the edge of the lamella. The device is also safe since the toothed wheel/mechanical control system is located high up in connection with the horizontal section of the track, which means that it is not dangerous for the user. Furthermore, the device is less expensive and lighter to use.

LIST OF DRAWINGS

[0009] The invention is now described in closer detail in connection with a preferred embodiment and with reference to the accompanying drawings, in which

Figure 1 shows a laminated lift door in connection of which a turning device of the invention can be installed,

Figure 2 is a side view of the turning device of the invention,

Figure 3 is a side view of the turning device as seen from the opposite side to Figure 2,

Figure 4 shows the turning device from behind,

Figure 5 is a top view of the turning device,

Figure 6 is a bottom view of the turning device,

Figure 7 shows the turning device in a locking position,

Figure 8 shows the turning device in a release position,

Figure 9 is a side view of a mechanical control element.

Figure 10 shows the mechanical control element as seen in a direction of its fixing track, and

Figures 11a to 11c are phase views of the operation of the turning device.

DETAILED DESCRIPTION OF THE INVENTION

[0010] Figure 1 shows a laminated lift door comprising four horizontal lamellas 1 on top of each other and hinged together by hinges 2, and track wheels 3 arranged in connection with outermost hinges 2 of the lamellas 1 and close to the lower edge of the door on the same vertical planes as track wheels 3 located at the outermost hinges 2. The door also comprises uppermost track wheels 3a but they are parts of turning devices to be described below, wherein the door will not be provided with the uppermost track wheels 3a controlling the turning of the upper lamella 1 until in connection with the installation of the turning devices. The track wheels 3 (and 3a) are designated to move along a track 4 provided on both sides of the door, each track comprising a vertical part 4a attached to a vertical part 5 of a door frame or the like, a horizontal part 4b located substantially at a height of an upper edge of the door and attached to a ceiling of a garage or the like, and a curved part connecting the vertical and horizontal parts 4a and

[0011] The rest of the figures in the drawings show in detail a preferred embodiment of the turning device of the invention, which may be arranged on either side or on both sides of the door shown in Figure 1. In order for the device to operate smoothly, it is, however, reasonable to use the turning device on both sides of the door. The turning device comprises a vertical frame 5 to be attached to the edge of the uppermost lamella; an articulated arm 6 comprising two articulated arm parts 8 and 9 pivotally mounted to each other by a folding joint 7 such that the parts 8 and 9 are allowed to fold around the joint 7 in one direction towards each other, a first articulated arm part 8 being pivotally mounted to the frame 5 by a first frame joint 10; a turning arm 11 whose one end is pivotally mounted by a second frame joint 12 at a distance in the frame 5 underneath the pivoted mounting point (the frame joint 10) of the first articulated arm part while a second end is pivotally mounted in the same axle 19 as a second articulated arm part 9, rotatably with respect to the second articulated arm part 9; a toothed wheel element 13 unturnably attached with respect to the second articulated arm part 9 but turnably attached with respect to the turning arm 11; an uppermost track wheel 3a designated to move along a track 4 and attached to the same axle as the toothed wheel element 13; and a mechanical control element 14 attached to a curved part 4c of the track 4 and arranged to be in engagement over a predetermined distance with the toothed wheel element 13 when being close to the beginning of an opening position and the end of a closing position of the door, whereby, when the door is opened, the mechanical control element 14 turns the toothed wheel element 13 and thus also the articulated arm parts 8 and 9 towards each other, which forces the uppermost track wheel 3a and the uppermost lamella 1 closer to each other, thus causing the uppermost lamella 1 to turn.

[0012] The frame 5 is provided with strengthening fastener lugs 5a to be arranged in an edge of the lamella 1, which is often slack. When the frame 5 is bolted both to the edge and on top of the lamella 1, the structure becomes sturdy and the installation distance of the device is right in a lateral direction of the lamella 1.

[0013] The length of both articulated arm parts 8 and 9 can be adjusted. This is implemented such that the parts 8 and 9 comprise two telescopically adjustable parts 8a, 8b and 9a, 9b which can at any given time be immovably locked with respect to each other by screws 15 and 16. For the adjustment, the inner parts 8b and 9b are provided with designations 8c and 9c. While carrying out the adjustment, each articulated arm part 8 and 9 should be subjected to equal adjustments in order for the lever relations not to change. This possibility to adjust is necessary since the distances between the lamella 1 and the track 4 may slightly change.

[0014] An outermost tooth 13a of the track wheel element 13 is elongated to enable interaction with the mechanical control element 14 to start smoothly as soon

as the door is being closed. The outermost tooth 13a also interacts with a locking device 17, which will be described in the following in connection with Figures 7 and 8 and which, when the door is opened, locks the turning device into a particular position with respect to the upper lamella 1 and, when the door is closed, releases the turning device from the locking.

[0015] In order to lock the turning device into the position shown in Figure 11c when the door is opened, a locking and releasing lever 18 of the locking device 17 is arranged close to the elongated tooth 13a which is arranged in the same axle 19 as the turning arm 11, articulated arm part 9, toothed wheel element 13 and the uppermost track wheel 3a. The lever 18 comprises a fixing sleeve 18a to be arranged around the axle 19 whereby the lever 18 is attached to the axle 19 by a fixing pin 20. The fixing sleeve 18a is provided with transverse openings 18b such that the lever 18 is allowed to turn a restricted distance around the axle 19. The lever 18 is also stretched into an extreme position at the front of the elongated tooth 13a by a string 21 arranged between the lever 18 and the toothed wheel element 13, which means that a clutch 18c in the sleeve is against a locking pin 22 fixedly arranged in the frame 5. When the door is open and situated in the horizontal section of the track 4 and a user starts closing, i.e. lowering, the door, the lever 18 comes into contact with the mechanical control element 14 before the elongated tooth 13a does, in which case the lever 18 turns and the clutch 18c becomes detached from the locking pin 22 such that the turning device is released from the locked position. Next, the elongated tooth 13a comes into contact with the mechanical control element 14 and the turning of the upper lamella 1 begins. When the door is opened the procedure is reversed, i.e. when the lever 18 becomes detached from the mechanical control element 14, the turning device locks, preventing the upper lamella 1 from moving with respect to the turning device. The locking of the upper lamella 1 is important in a door equipped e.g. with an opener (not shown in the drawings) since the operating arm of the opener uses the door by pulling and pushing the upper lamella 1. If the door is opened with vigour, the door may start bouncing and the lamellas 1 may come into contact with the ceiling if there is little space above the horizontal section 4b of the track 4. [0016] The mechanical control element 14 shown in Figures 9 and 10 comprises a "chainlike" part 14a curved in a similar manner to that of the curved section 4c of the track 4 and provided with transverse pins 14c located at a distance from each other and designated to interact with the teeth of the toothed wheel element 13. The part 14a is attached to a side of the track section 4c by a frame part 14d fixedly connected thereto. The part 14 d is provided with elongated mounting holes 14e to enable the part 14d to be mounted adjustably. Next to the chainlike part 14a, the frame part 14d comprises spikes 14f to determine the correct vertical position of the mechanical control element 14 when they are

pressed into the track section 4c.

[0017] The operation of the turning device is shown step by step in Figures 11a to 11c. When the door is opened, i.e. when it is lifted up, the mechanical control device 14 forces the toothed wheel element 13 to turn around its axle 19. Since the articulated arm part 9 is unturnably attached to the same axle, the articulated arm parts 8 and 9 also start folding with respect to each other, in which case the uppermost track wheel 3a and the upper lamella 1 also start to draw closer to each other, i.e. the upper lamella 1 turns. In Figure 11a, the door is closed, which means that the articulated arm parts 8 and 9 are in a horizontal position and the track wheel element 13 comes into contact with the foremost part of the mechanical control element 14. In Figure 11b, the door has been lifted a few centimetres, in which case the toothed wheel element 13 has turned about half its course owing to the mechanical control element 14, and the uppermost track wheel 3a is rising from the curved section 4c to the horizontal section 4b while the upper lamella is turned about 20°. In Figure 11c, the door has been lifted twice as much as in Figure 11b, which means that the toothed wheel element 13 starts to become detached from being engaged with the mechanical control element 14 while the articulated arms 8 and 9 as well as the turning arm 11 are in their extreme positions. The uppermost track wheel 3a is also just arriving at the horizontal section 4b. This is the point where the abovedescribed locking between the upper lamella 1 and the turning device takes place as well and henceforth, as the lifting movement proceeds, the upper lamella 1 continues to move forward uninfluenced by the turning device, being, however, locked as described above. Similarly, when the door is closed, the turning device guides the upper lamella downwards into the position of Figure 11a, taking the same path as described above.

[0018] The description of the invention disclosed above is only intended to illustrate the turning device of the invention. A person skilled in the art can, however, implement the details of the invention in many alternative ways without deviating from the scope defined by the attached claims.

45 Claims

1. A turning device in connection with a lift door comprising several horizontal lamellas (1) hinged together on top of each other, and track wheels (3) arranged at outermost hinges (2) of the lamellas and at the lower edge of the door designated to move along a track (4) arranged on both sides of the door, each track (4) comprising a vertical part (4a) attached to a vertical part of a frame of the door, a horizontal part (4b) located substantially at a height of the upper edge of the door, and a curved part (4c) connecting the vertical and horizontal parts, characterized in that the turning device to be

arranged at least on one side of the door comprises:

a vertical frame (5) to be attached to an edge of an uppermost lamella (1),

an articulated arm (6) comprising two articulated arm parts (8, 9) pivotally mounted to each other by a folding joint (7) such that the articulated arm parts are allowed to fold around said joint in one direction towards each other, a first articulated arm part (8) being pivotally mounted to the frame (5) by a first frame joint (10),

a turning arm (11) whose one end is pivotally mounted by a second frame joint (12) at a distance in the frame (5) underneath the pivoted mounting point (10) of the first articulated arm part (8) while a second end is pivotally mounted in the same axle (19) as a second articulated arm part (9), rotatably with respect to the second articulated arm part (9),

a toothed wheel element (13) unturnably attached with respect to the second articulated arm part (9) but turnably attached with respect to the turning arm (11),

an uppermost track wheel (3a) to move along the track (4), attached to the same axle (19) as the toothed wheel element (13), and

the toothed wheel element (13), and a mechanical control element (14) attached to the zone of the curved part (4c) of the track and arranged to be connected over a predetermined distance with the toothed wheel element when being close to the beginning of an opening position and the end of a closing position of the door, whereby, when the door is opened, the mechanical control element (14) turns the toothed wheel element (13) and thus also the articulated arm parts (8, 9) towards each other, which forces the uppermost track wheel (3a) and the uppermost lamella (1) closer to each other, thus causing the uppermost lamella to turn.

- 2. A turning device as claimed in claim 1, characterized in that the length of each articulated arm part (8, 9) is adjustable such that said parts (8, 9) comprise two telescopically adjustable parts (8a, 8b; 9a, 9b), which are, at any given time, immovably lockable with respect to each other by locking elements (15, 16).
- **3.** A turning device as claimed in claim 1 or 2, **characterized** in that an outermost tooth (13a) of the track wheel element (13) is elongated.
- 4. A turning device as claimed in any one of the preceding claims, characterized in that the turning device comprises a locking device (17) for locking the turning device into a particular position with respect to the upper lamella (1) when the door is being

opened, the locking device comprising a turnable locking and releasing lever (18) arranged close to the elongated tooth (13a) of the toothed wheel element (13) and mounted in the same axle (19) as the turning arm (11), articulated arm part (9), toothed wheel element (13) and the uppermost track wheel (3a), and interacting with a locking pin (22) fixedly mounted in the frame (5).

5. A turning device as claimed in any one of the preceding claims, characterized in that the mechanical control element (14) comprises a chainlike part (14a) curved in a similar manner to that of the curved section (4c) of the track (4) and provided with transverse pins (14c) located at a distance from each other and designated to interact with the teeth of the toothed wheel element (13).

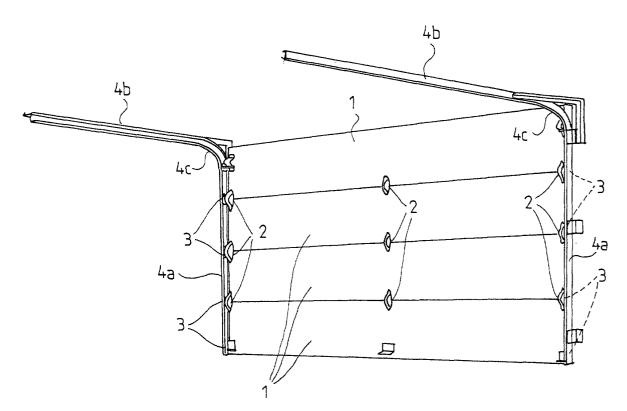


FIG. 1

