



(11) **EP 2 004 941 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:  
**19.05.2010 Bulletin 2010/20**

(51) Int Cl.:  
**E05F 15/10<sup>(2006.01)</sup> E05F 15/14<sup>(2006.01)</sup>**  
**E06B 3/48<sup>(2006.01)</sup>**

(21) Application number: **07713109.2**

(86) International application number:  
**PCT/IB2007/000559**

(22) Date of filing: **09.03.2007**

(87) International publication number:  
**WO 2007/105057 (20.09.2007 Gazette 2007/38)**

(54) **INDUSTRIAL DOOR**

INDUSTRIETOR

PORTE INDUSTRIELLE

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR**

(30) Priority: **10.03.2006 IT BO20060170**

(43) Date of publication of application:  
**24.12.2008 Bulletin 2008/52**

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**Description**TECHNICAL FIELD

**[0001]** The present invention relates to an industrial door.

BACKGROUND ART

**[0002]** To close openings made through the masonry structure of an industrial shed, it is known to provide a door of the type comprising a plurality of vertical leaves that are slidably coupled or hinged to one another, a substantially horizontal guide fixed to the masonry structure above the leaves, and a conveying carriage, which is connected to one of the two end leaves, and is engaged to a chain conveyor for performing rectilinear displacements along the guide and displacing the leaves between an opening position and a closing position of the industrial door.

**[0003]** Generally, the chain conveyor is wound to form an endless loop about a pair of sprocket wheels mounted so as to turn about respective longitudinal axes under the thrust of an electric motor fixed to the masonry structure on the outside of the guide of the conveying carriage.

**[0004]** Known industrial doors of the above type have some drawbacks principally resulting from the fact that the chain conveyor is relatively noisy, involves frequent maintenance interventions, and is relatively cumbersome on account of the installation of the aforesaid electric motor on the masonry structure and on the outside of the guide of the conveying carriage.

**[0005]** Document DE 19932891 A1 relates to an industrial door comprising at least one leaf and actuator means for displacing the leaf between an opening position and a closing position of the industrial door itself. The actuator means comprise a carriage for advance of the leaf, a guide for guiding the carriage, and actuator means for advance of the carriage along the guide and in a given direction. The actuator means are carried by the carriage and comprise a motor mounted on the carriage for displacing the carriage itself along the guide.

DISCLOSURE OF INVENTION

**[0006]** It is an object of the present invention to provide an industrial door designed to eliminate the aforementioned drawbacks and that will be simple and inexpensive to produce.

**[0007]** According to the present invention, there is provided an industrial door as claimed in the accompanying claims.

BRIEF DESCRIPTION OF THE DRAWINGS

**[0008]** The present invention will now be described with reference to the accompanying drawings, which illustrates a non-limiting example of embodiment thereof

and in which:

Figure 1 is a schematic side view, with parts enlarged for reasons of clarity, of a preferred embodiment of the industrial door of the present invention; Figures 2 and 3 are two schematic perspective views of a detail of the industrial door of Figure 1; Figure 4 illustrates, in schematic perspective view, with parts enlarged for reasons of clarity, the industrial door of Figure 1 in two different operating positions; and Figure 5 is a schematic perspective view of a variant of the industrial door of Figure 1.

15 BEST MODE FOR CARRYING OUT THE INVENTION

**[0009]** With reference to Figure 1, designated as a whole by 1 is a door mounted to close an opening 2 made through the masonry structure 3 of an industrial shed.

20 **[0010]** The door 1 comprises a plurality of vertical plane leaves 4 (in the case in point, four leaves 4), which have a substantially rectangular shape, are hinged together in points corresponding to respective longitudinal edges parallel to a vertical direction 5 so as to turn, with respect to one another and according to modalities that will be illustrated in greater detail in what follows, about corresponding axes 6 of fulcrum parallel to the direction 5, and comprise a first end leaf 4 (hereinafter designated by 4a), hinged to the structure 3 so as to turn, with respect to the structure 3, about an axis 7 of fulcrum parallel to the axes 6, a second end leaf 4 (hereinafter designated by 4b), opposite to the leaf 4a, and two intermediate leaves 4 (hereinafter designated by 4c), arranged between the leaves 4a and 4b.

35 **[0011]** The door 1 moreover comprises a guide 8, which has an elongated shape, extends above the leaves 4 in a horizontal direction 9 transverse to the direction 5, and is defined by a tubular sectional element 10, which is fixed to the structure 3 above the opening 2, is substantially U-shaped with its concavity facing downwards, and comprises two longitudinal edges bent so as to define two horizontal plane tracks 11, set parallel to one another and to the direction 9.

45 **[0012]** According to what is illustrated in Figures 2 and 3, the leaves 4 are mobile between a closing position (Figure 1) and an opening position (Figure 4b) of the opening 2 under the thrust of a conveying device 12 comprising a carriage 13, which is mounted within the guide 8 and comprises, in turn, a supporting frame 14 provided with two mutually parallel axles 15, 16, each of which is coupled in a rotatable way to the frame 14 so as to turn, with respect to the frame 14 itself, about a longitudinal axis 17 thereof parallel to a horizontal direction 18 orthogonal to the directions 5 and 9, and carries fitted to its ends two wheels 19 engaged in the two tracks 11.

55 **[0013]** The axle 15 is set in rotation about its own axis 17 by an actuator device 20 comprising an electric motor 20a, which is mounted on the frame 14 and has an output

shaft defined by a screw 21, which extends parallel to the direction 9, and meshes with a helical gear 22, fitted on a supporting shaft 23 parallel to the direction 18. The shaft 23 is mounted in a coaxial position facing a transmission shaft 24 coupled, normally, in an angularly fixed way to the shaft 23 itself via the interposition of a clutch 25, in the case in point a clutch of an electrical type.

**[0014]** The shaft 24 sets in rotation the axle 15 via a chain 26 of gears comprising a first gear 27a fitted on the shaft 24 and a second gear 27b fitted on the axle 15 and coupled to the gear 27a itself.

**[0015]** The carriage 13 is connected to the leaf 4b via a dragging rod 28, which extends downwards from the carriage 13, has a longitudinal axis 28a parallel to the direction 5, is coupled in a rotatable and axially slidable way, in a position corresponding to a bottom end thereof, to an outer longitudinal edge of the leaf 4b, and is provided with a substantially parallelepipedal top bushing 29, which is fixed to a top end of the rod 28 in a direction transverse to the axis 28a and is slidably coupled to a guide 30 made in the frame 14 parallel to the direction 9.

**[0016]** The bushing 29 is moreover coupled via a screw/nut screw coupling, to a screw 31 of a corresponding actuation device 32, which defines part of the conveying device 12 and comprises an electric motor 33, which is mounted on the frame 14 and has an output shaft 34 opposite to the screw 21 of the motor 20a. The shaft 34 extends parallel to the direction 9 and is connected to the screw 31 via a belt transmission 35 of a known type for setting the screw 31 in rotation and imparting upon the bushing 29, and hence upon the rod 28, rectilinear displacements along the guide 30 in the direction 9.

**[0017]** Each electric motor 20a, 33 is supplied via a corresponding electrical-sliding-contact supply device 36 comprising a plurality of guides 37 made of conductive material (in the case in point, two guides 37) fixed within the sectional element 10 parallel to the direction 9, and a plurality of electrical contacts 38, which are also made of conductive material, are equal in number to the corresponding guides 37, project upwards from the corresponding motor 20a, 33, and are designed to engage slidably the corresponding guides 37 during advance of the carriage 13 along the guide 8.

**[0018]** Operation of the door 1 will now be described with reference to Figures 1 and 4 starting from an instant in which:

- the leaves 4 are arranged in their closing position of the opening 2 (Figure 1);
- the two motors 20a, 33 are deactivated; and
- the bushing 29 is set in a point corresponding to one end of the guide 30 adjacent to the axle 16 (Figures 1-3 and 4a).

**[0019]** To open the door 1, the carriage 13 is displaced along the guide 8 via the actuation device 20 so that, by combining the displacement of the carriage 13 in the di-

rection 9 with the rotation of the leaves 4a, 4b, and 4c about the corresponding axes 6, 7, and 28a, the leaves 4a, 4b, and 4c will be folded substantially in contact with one another (Figure 4a). Proper rotation of the leaves 4a, 4b, and 4c about the corresponding axes 6, 7, and 28a is guaranteed by a guide device (of a known type and not illustrated), which comprises a shaped guide projecting laterally from the guide 8 and, for each leaf 4a, 4b, and 4c, a corresponding roller designed to engage the shaped guide itself.

**[0020]** When the carriage 13 reaches the end of the guide 8, the encumbrance of the carriage 13 itself in the direction 9 prevents complete and proper folding of the leaf 4b in contact with the adjacent leaf 4c (Figure 4a). Folding of the leaf 4b, and hence opening of the door 1, is completed by activating the electric motor 33 so as to displace the bushing 29, and hence the dragging rod 28, between the ends of the guide 30 in the direction 9 (Figure 4b).

**[0021]** When the bushing 29 reaches the end of the guide 30 adjacent to the axle 15, completing folding of the leaf 4b, the motor 33 is deactivated in response to a signal coming from a sensor 39 (Figure 1) fixed to the structure 3 for detecting complete opening of the door 1.

**[0022]** To close the door 1, the carriage 13 is displaced along the guide 8 via the actuation device 20 so that, by combining the displacement of the carriage 13 in the direction 9 with the rotation of the leaves 4a, 4b, and 4c about the corresponding axes 6, 7, and 28a, the leaves 4a, 4b, and 4c set themselves in a position substantially coplanar to one another.

**[0023]** When the carriage 13 reaches the end of the guide 8, the encumbrance of the carriage 13 itself in the direction 9 prevents complete and proper closing of the leaf 4b in contact with the structure 3. Closing of the leaf 4b, and hence of the door 1, is completed by activating the electric motor 33 so as to displace the bushing 29, and hence the dragging rod 28, between the ends of the guide 30 in the direction 9.

**[0024]** When the bushing 29 reaches the end of the guide 30 adjacent to the axle 16, thus completing closing of the leaf 4b, the motor 33 is deactivated in response to a signal coming from a sensor 40 (Figure 1) fixed to the structure 3 for detecting complete closing of the door 1.

**[0025]** The door 1 thus presents a number of advantages principally resulting from the fact that:

- the entire actuation device 20 of the carriage 13 is mounted directly on the carriage 13 itself, has relatively small overall dimensions, and is relatively quiet;
- the actuation device 32 of the dragging rod 28 of the leaf 4b guarantees a complete and proper opening and closing of the door 1, in particular when the conformation of the opening 2 prevents installation of a guide 8 having a length, measured parallel to the direction 9, greater than the width of the opening 2, which is also measured parallel to the direction 9; and

- the clutch 25 enables, in the case of absence of supply of the motor 20a, decoupling of the shafts 23 and 24 from one another and manual displacement of the carriage 13 along the guide 8.

**[0026]** The variant of Figure 5 differs from what is illustrated in the preceding figures only for the fact that, therein, the leaves 4a, 4b, and 4c are eliminated and replaced, in the case in point, with a single slidable leaf 4, which can move in the direction 9 between a closing position (illustrated with a solid line in Figure 5) and an opening position (illustrated with a dashed line in Figure 5) of the opening 2.

### Claims

1. An industrial door comprising at least one leaf (4) and actuator means (12) for displacing the leaf (4) between an opening position and a closing position of the industrial door itself, said actuator means (12) comprising a carriage (13) for advance of the leaf (4), first guide mean (8) for guiding the carriage (13), and first actuator means (20) for advance of the carriage (13) along said first guide means (8) and in a given direction (9), the first actuator means (20) being carried by the carriage (13) and comprise a first motor (20a) mounted on the carriage (13) for displacing the carriage (13) itself along said first guide means (8); and being **characterized in that** the leaf (4) is slidably coupled to the carriage (13) to enable its own displacement, with respect to the carriage (13) itself, in said direction (9); said actuator means (12) comprising second actuator means (32) for displacing the leaf (4) along the carriage (13).
2. An industrial door according to Claim 1, wherein the carriage (13) comprises a frame (14) and at least one axle (15), which is coupled in a rotatable way to the frame (14) to turn about a given longitudinal axis (17) thereof, and is provided with at least one wheel (19) for advance of the carriage (13) along said first guide means (8); the first motor (20a) being mounted on the frame (14) and having a first output shaft (21) designed to impart upon the axle (15) a motion of rotation about said axis (17).
3. An industrial door according to Claim 2, wherein said first actuator means (20) comprise first coupling means (25) for connecting the axle (15) and said first output shaft (21) together; the first coupling means (25) being mobile between a coupling position, in which the axle (15) turns about said axis (17) under the thrust of the first output shaft (21), and a position of decoupling of the first output shaft (21) from the axle (15).
4. An industrial door according to Claim 3, wherein said

first coupling means (25) comprise a clutch (25) set between the first output shaft (21) and the axle (15).

5. An industrial door according to any one of the preceding claims, wherein said first motor (20) is an electric motor; first supply means (36) being arranged along said first guide means (8) for electrical supply of the first motor (20) itself.
6. An industrial door according to any one of the preceding claims, wherein said second actuator means (32) are carried by the carriage (13) and comprise means (28) for drawing the leaf (4), second guide means (30) made on the carriage (13) and slidably engaged by said drawing means (28), and a second motor (33) mounted on the carriage (13) itself for displacing the drawing means (28) along said second guide means (30).
7. An industrial door according to Claim 6, wherein the second motor (33) has a second output shaft (34); second coupling means (31, 35) being provided for connecting together the second output shaft (34) and said drawing means (28).
8. An industrial door according to Claim 7, wherein said second coupling means (31, 35) comprise a screw/nut screw coupling set between the second output shaft (34) and said drawing means (28).
9. An industrial door according to Claim 7 or 8, wherein said second motor (33) is an electric motor; second supply means (36) being arranged along said first guide means (8) for electrical supply of the second motor (33) itself.

### Patentansprüche

1. Industrietor, welches zumindest einen Flügel (4) und ein Betätigungsmittel (12) zum Verlagern des Flügels (4) zwischen einer geöffneten und einer geschlossenen Position des Industrietors aufweist, wobei das Betätigungsmittel (12) einen Fahrwagen (13) zum Bewegen des Flügels (4), ein erstes Führungsmittel (8) zum Führen des Fahrwagens (13) und ein erstes Antriebsmittel (20) zum Bewegen des Fahrwagens (13) entlang des ersten Führungsmittels (8) und in einer vorbestimmten Richtung (9) aufweist, wobei das erste Antriebsmittel (20) von dem Fahrwagen (13) getragen ist und einen auf dem Fahrwagen (13) montierten ersten Motor (20a) zum Verlagern des Fahrwagens (13) entlang des ersten Führungsmittels (8) aufweist; **dadurch gekennzeichnet, dass** der Flügel (4) derart gleitbar mit dem Fahrwagen (13) wirkverbunden ist, dass dieser relativ zu dem Fahrwagen (13) in der Richtung (9) verlagerbar ist; und dass das Betätigungsmittel (12) ein zweites

Antriebsmittel (32) zum Verlagern des Flügels (4) entlang des Fahrwagens (13) aufweist.

2. Industrietor nach Anspruch 1, wobei der Fahrwagen (13) einen Rahmen (14), zumindest eine Achse (15), welche zum Rotieren um eine vorbestimmte longitudinale Mittelachse (17) der Achse (15) rotierbar mit dem Rahmen (14) wirkverbunden ist, und zumindest ein Rad (19) zum Bewegen des Fahrwagens (13) entlang dem ersten Führungsmittel (8) aufweist; wobei der erste Motor (20a) auf dem Rahmen (14) montiert ist und eine erste Ausgangswelle (21) aufweist, welche zum Aufbringen einer Rotationsbewegung auf die Achse (15) um die Mittelachse (17) ausgebildet ist.
3. Industrietor nach Anspruch 2, wobei das erste Antriebsmittel (20) ein erstes Kupplungsmittel (25) zum Verbinden der Achse (15) mit der ersten Ausgangswelle (21) aufweist; wobei das erste Kupplungsmittel (25) beweglich ist zwischen einer Kupplungsposition, in welcher die Achse (15) unter der Wirkung der ersten Ausgangswelle (21) um die Mittelachse (17) rotiert, und einer Abkupplungsposition, in welcher die erste Ausgangswelle (21) von der Achse (15) abgekuppelt ist.
4. Industrietor nach Anspruch 3, wobei das erste Kupplungsmittel (25) eine Kupplung (25) aufweist, welche zwischen der ersten Ausgangswelle (21) und der Achse (15) angeordnet ist.
5. Industrietor nach einem der vorhergehenden Ansprüche, wobei der erste Motor (20) ein Elektromotor ist; und wobei ein erstes Versorgungsmittel (36) zum elektrischen Versorgen des ersten Motors (20) entlang des ersten Führungsmittels (8) angeordnet ist.
6. Industrietor nach einem der vorhergehenden Ansprüche, wobei das zweite Antriebsmittel (32) von dem Fahrwagen (13) getragen ist, ein Mittel (28) zum Mitschleppen des Flügels (4), ein zweites Führungsmittel (30) des Fahrwagens (13), welches gleitend mit dem Schleppmittel (28) in Wirkverbindung ist, und ein zweites Motor (33) aufweist, welcher zum Verlagern des Schleppmittels (28) entlang des zweiten Führungsmittels (30) auf dem Fahrwagen (13) montiert ist.
7. Industrietor nach Anspruch 6, wobei der zweite Motor (33) eine zweite Ausgangswelle (34) aufweist; und wobei zweite Kupplungsmittel (31, 35) zum Verbinden der zweiten Ausgangswelle (34) und des Schleppmittels (28) vorgesehen sind.
8. Industrietor nach Anspruch 7, wobei die zweiten Kupplungsmittel (31, 35) eine Spindel/Mutter-Einrichtung aufweisen, welche zwischen der zweiten

Ausgangswelle (34) und dem Schleppmittel (28) angeordnet ist.

9. Industrietor nach Anspruch 7 oder 8, wobei der zweite Motor (33) ein Elektromotor ist; und wobei ein zweites Versorgungsmittel (36) zum elektrischen Versorgen des ersten Motors (20) entlang des ersten Führungsmittels (8) angeordnet ist.

## Revendications

1. Porte industrielle comprenant au moins un vantail (4) et un moyen d'actionnement (12) pour déplacer le vantail (4) entre une position d'ouverture et une position de fermeture de la porte industrielle elle-même, ledit moyen d'actionnement (12) comprenant un chariot (13) pour l'avance du vantail (4), un premier moyen de guidage (8) pour guider le chariot (13) et un premier moyen d'actionnement (20) pour l'avance du chariot (13) le long dudit premier moyen de guidage (8) et dans une direction donnée (9), le premier moyen d'actionnement (20) étant porté par le chariot (13) et comprenant un premier moteur (20a) monté sur le chariot (13) pour déplacer le chariot (13) lui-même le long dudit premier moyen de guidage (8), et étant **caractérisé en ce que** le vantail (4) est accouplé au chariot (13) de façon coulissante, afin de permettre son propre déplacement par rapport au chariot (13) lui-même, dans ladite direction (9), ledit moyen d'actionnement (12) comprenant un second moyen d'actionnement (32) pour déplacer le vantail (4) le long du chariot (13).
2. Porte industrielle suivant la revendication 1, le chariot (13) comprenant une base (14) et au moins un axe tournant (15), qui est accouplé de manière rotative à la base (14), afin de tourner autour d'un axe longitudinal donné (17) de celle-ci, base munie d'au moins une roue (19) pour l'avance du chariot (13) le long dudit premier moyen de guidage (8), le premier moteur (20a) étant monté sur la base (14) et ayant un premier arbre de sortie (21) destiné à imprimer à l'axe tournant (15) un mouvement de rotation autour dudit axe (17).
3. Porte industrielle suivant la revendication 2, ledit premier moyen d'actionnement (20) comprenant un premier moyen d'accouplement (25) pour relier, l'un à l'autre, l'axe tournant (15) et ledit premier arbre de sortie (21), le premier moyen d'accouplement (25) étant mobile entre une position d'accouplement, dans laquelle l'axe tournant (15) tourne autour dudit axe (17) sous la poussée du premier arbre de sortie (21), et une position, dans laquelle le premier arbre de sortie (21) est désaccouplé de l'axe tournant (15).
4. Porte industrielle suivant la revendication 3, ledit pre-

mier moyen d'accouplement (25) comprenant un embrayage (25) disposé entre le premier arbre de sortie (21) et l'axe tournant (15).

5. Porte industrielle suivant une quelconque des revendications précédentes, ledit premier moteur (20) étant un moteur électrique, un premier moyen d'alimentation (36) étant disposé le long dudit moyen de guidage (8) pour l'alimentation électrique du premier moteur (20) lui-même. 5  
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6. Porte industrielle suivant une quelconque des revendications précédentes, ledit second moyen d'actionnement (32) étant porté par le chariot (13) et comprenant un moyen (28) pour tirer le vantail (4), un second moyen de guidage (30) réalisé sur le chariot (13) et engagé de façon coulissante avec ledit moyen de tirage (28), et un second moteur (33) monté sur le chariot (13) lui-même pour déplacer le moyen de tirage (28) le long dudit second moyen de guidage (30). 15  
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7. Porte industrielle suivant la revendication 6, le second moteur (33) ayant un second arbre de sortie (34), des seconds moyens d'accouplement (31, 35) étant prévus pour relier l'un à l'autre, le second arbre de sortie (34) et ledit moyen de tirage (28). 25
8. Porte industrielle suivant la revendication, lesdits seconds moyens d'accouplement (31, 35) comprenant un accouplement par vis et écrou placé entre le second arbre de sortie (34) et ledit moyen de tirage (28). 30
9. Porte industrielle suivant la revendication 7 ou 8, ledit second moteur (33) étant un moteur électrique, un second moyen d'alimentation (36) étant disposé le long du premier moyen de guidage (8) pour l'alimentation électrique du second moteur (33) lui-même. 35  
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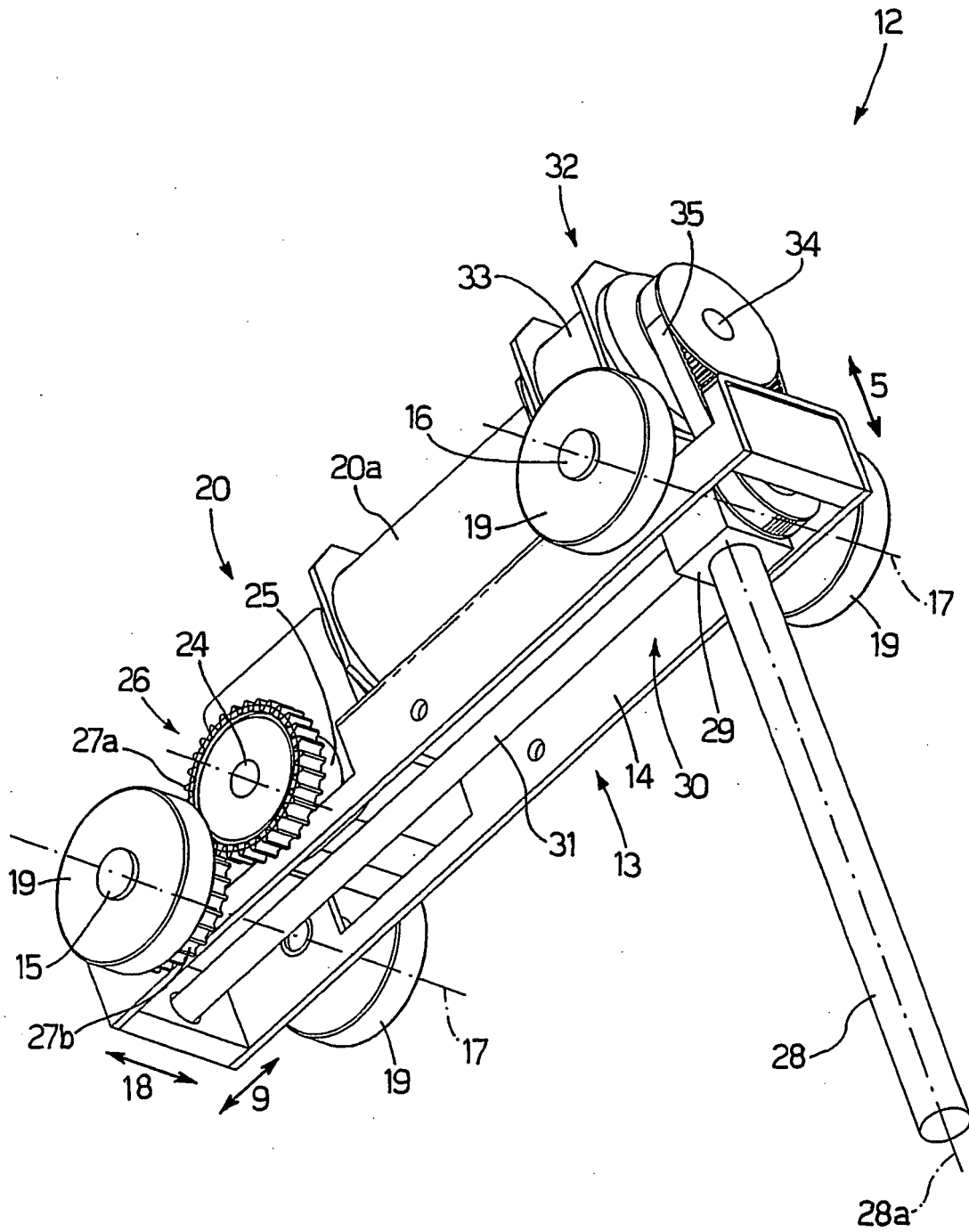


Fig.2

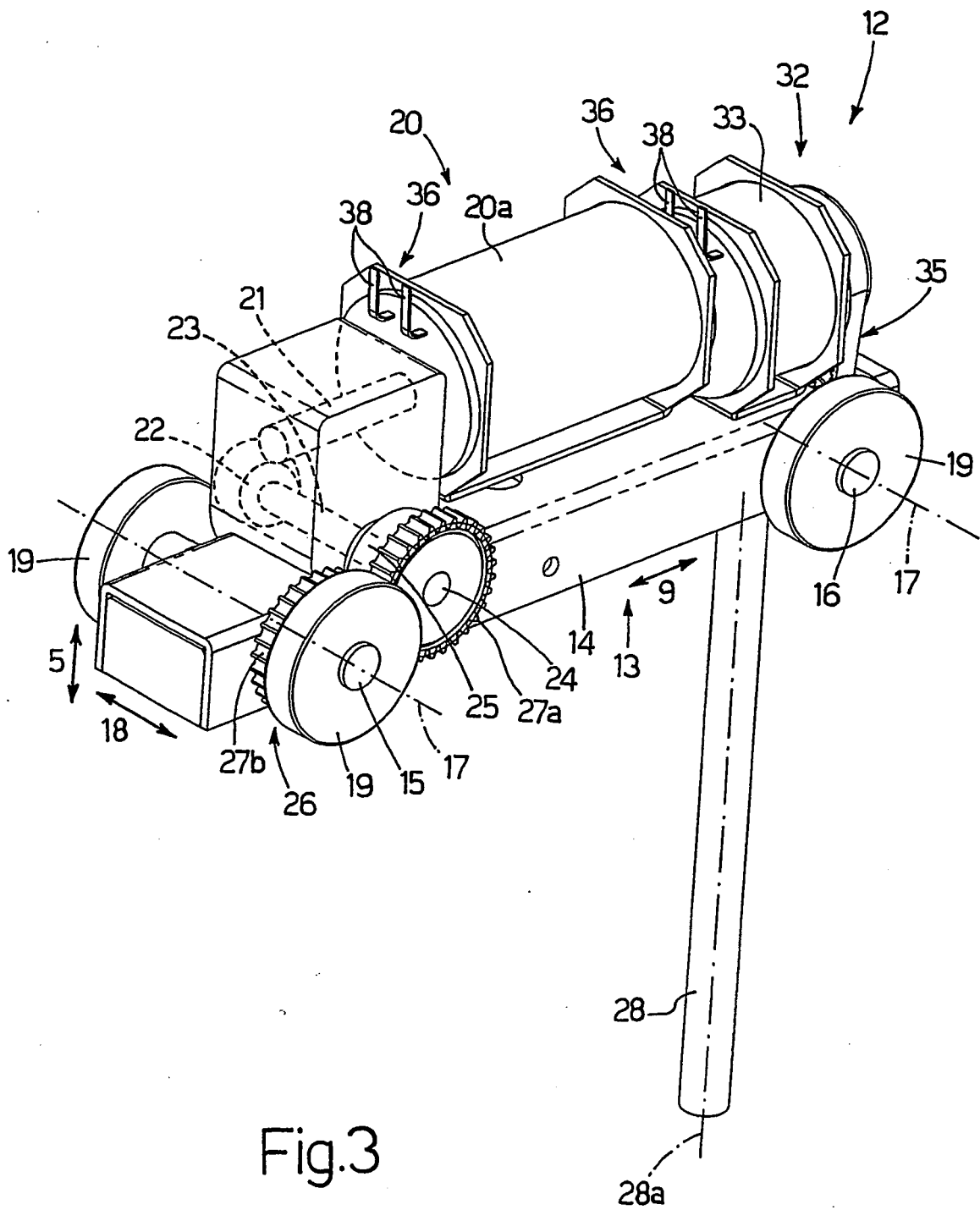


Fig.3

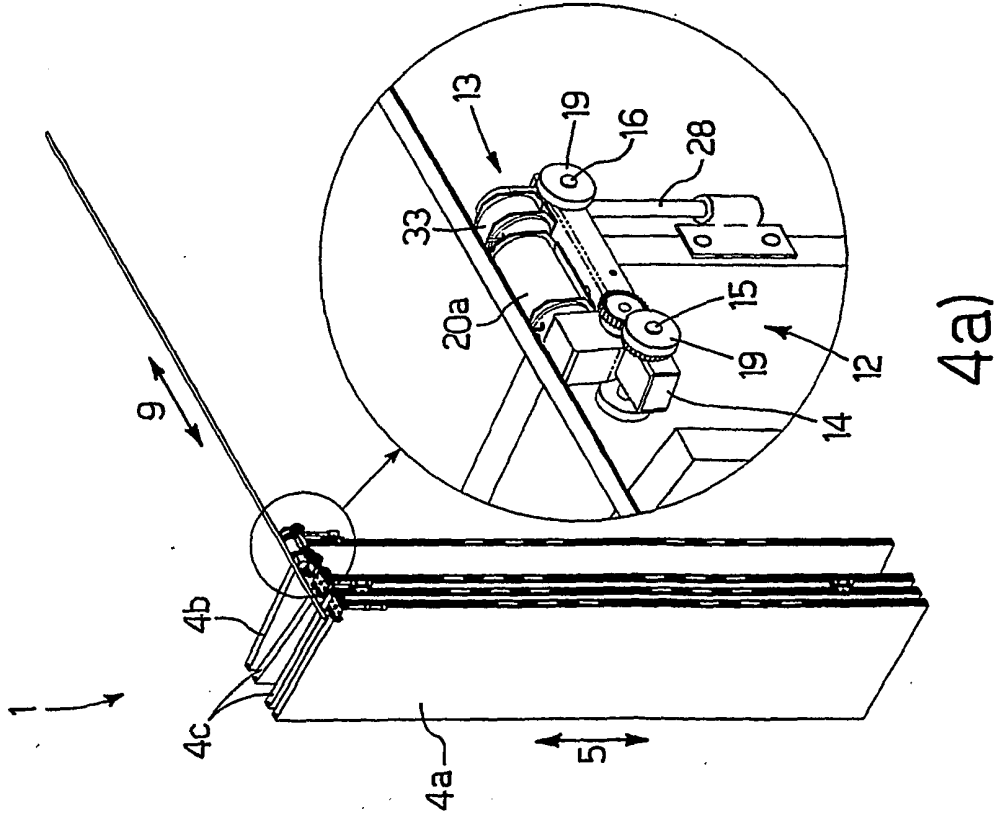
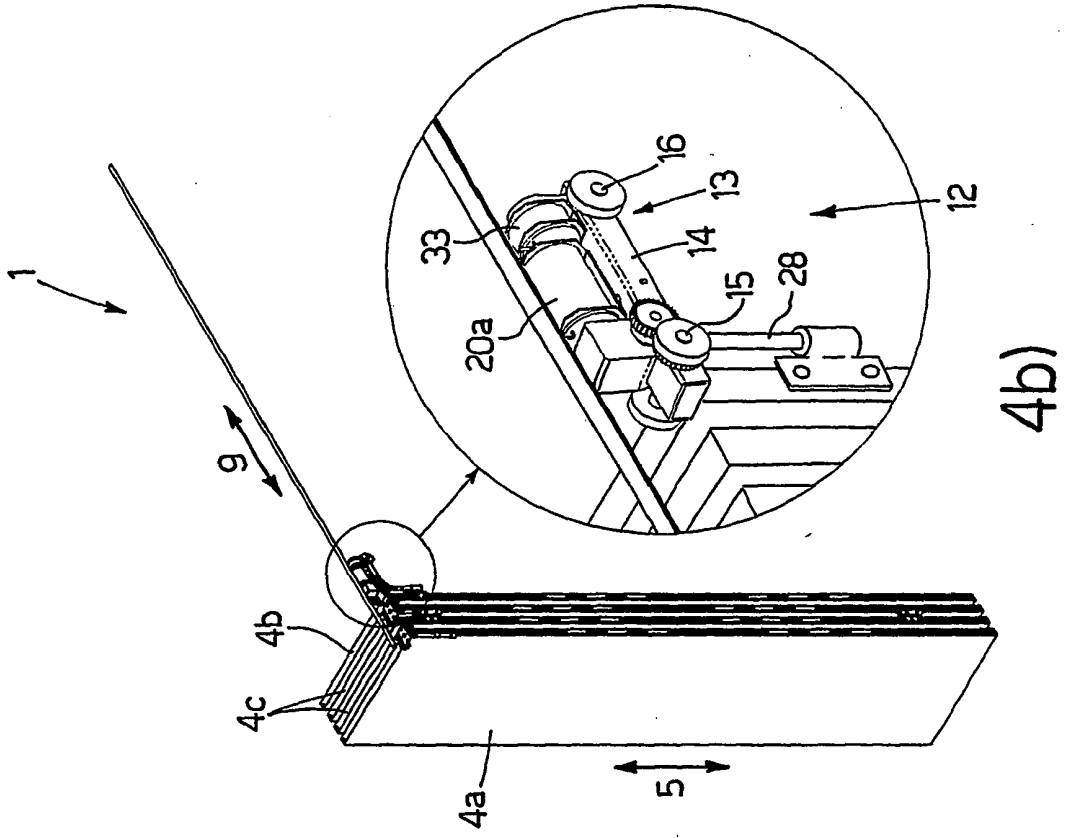


Fig.4

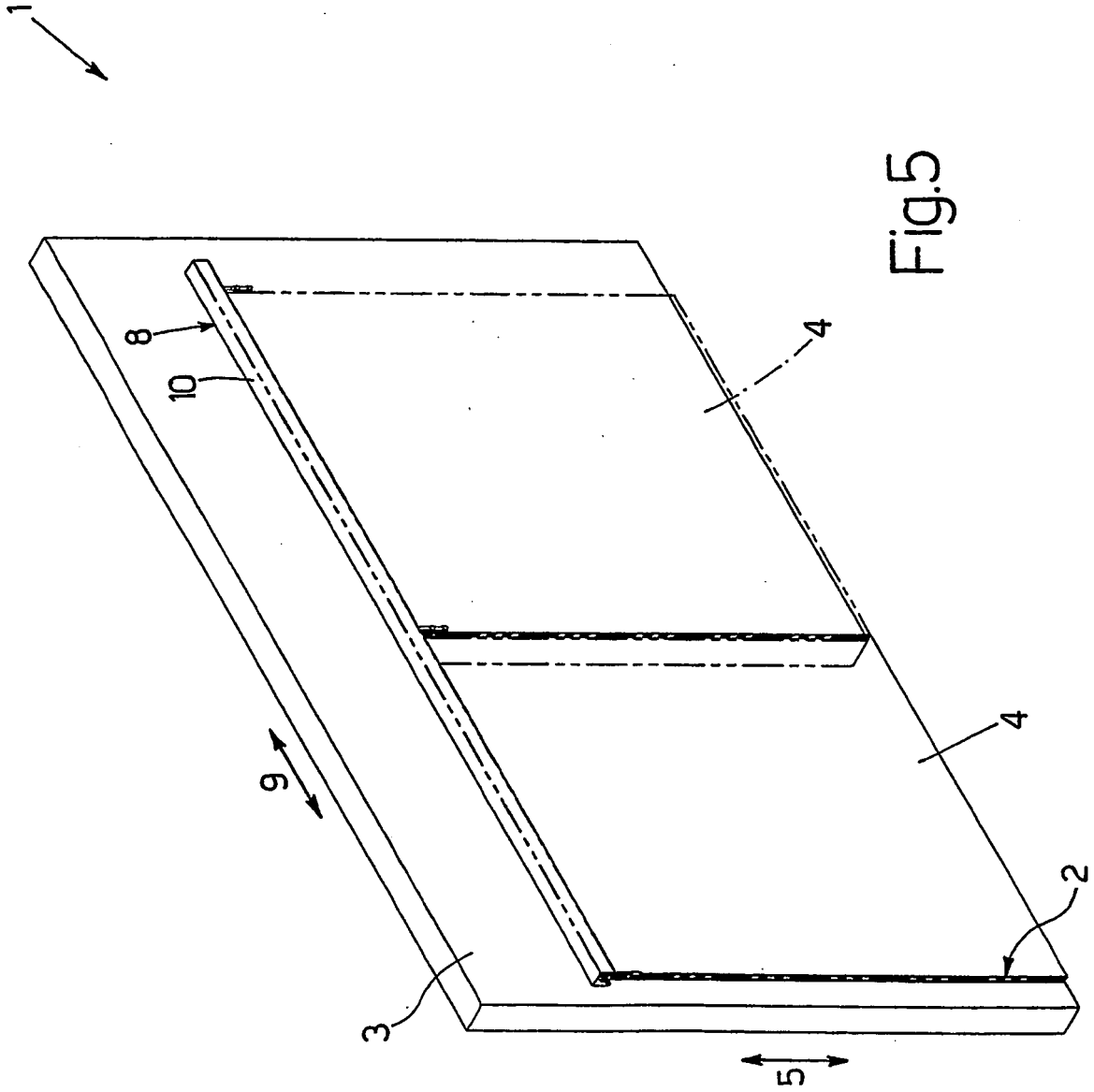


Fig.5

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

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