(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 212 009**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **85202003.1**

(22) Date of filing: **29.11.85**

(51) Int. Cl.⁴: **E 06 B 9/10**, E 06 B 9/20

(30) Priority: **13.08.85 NL 8502236**

(43) Date of publication of application: **04.03.87**
Bulletin 87/10

(84) Designated Contracting States: **AT BE CH DE FR GB IT LI LU NL SE**

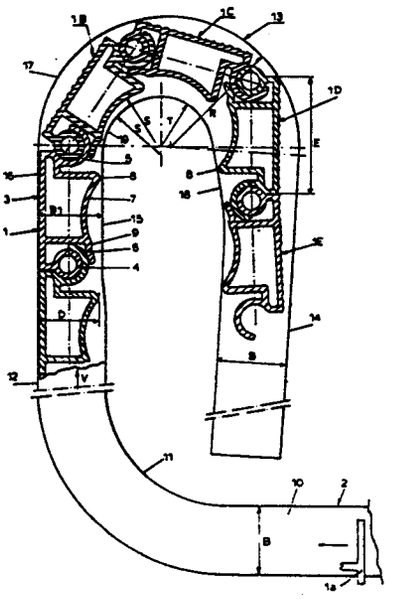
(71) Applicant: **AHREND GROEP B.V., Singel 130, NL-1015 AE Amsterdam (NL)**

(72) Inventor: **Rodenburg, Wijtse Bauke, Kattenbosch 24, NL-5243 SE Rosmalen (NL)**
Inventor: **Smits, Johannes Gerardus, Irenestraat 53, NL-5491 KC Sint Oedenrode (NL)**

(74) Representative: **Lips, Hendrik Jan George, Ir. et al, HAAGSCH OCTROOIBUREAU Breitnerlaan 146, NL-2596 HG Den Haag (NL)**

(54) Roller door comprising mutually hingedly connected lamellae and guiding rails in which the ends of the lamellae are inserted.

(57) Roller door comprising a number of mutually hingedly connected extended lamellae (1) and guiding rails (2) positioned at the ends of the lamellae, said guiding rails (2) comprising two bent parts, the first one (11) extending over about 90° and the second one (13) over about 180°, to bring the lamellae (1) outside the plane of the door opening on opening the door, said lamellae (1) having a substantially flat front face (3) and being provided with two spaced pivots (4, 5) located behind the front face (3) and being made in such way that the pivots (4, 5) of succeeding lamellae (1) can be slid into each other, a curved guiding plane (7) being formed behind and between the pivots (4, 5) and cooperating with an interior bent wall section (19) of the guiding rail (2).



EP 0 212 009 A2

02-12009

Roller door comprising mutually hingedly connected lamellae and guiding rails in which the ends of the lamellae are inserted.

The invention relates to a roller door comprising a number of mutually hingedly connected extended lamellae and guiding rails positioned at the ends of the lamellae, in which these ends are inserted and extend themselves in a distance from and parallel to each other along two sides of the door opening and comprise bent parts to bring the lamellae outside the plane of the door opening on opening the door, said lamellae having a substantially flat front face such that the front faces of the lamellae substantially link up with each other in the closed position of the door, the hinge parts of the lamellae being connected with that flat front face.

These known roller doors are applied at a large scale for closing of cabinets, in particular for office furniture. The advantage of such doors is, that they do not occupy space when the cabinet is opened, as the door is within the interior of the cabinet.

As the distance over which the door should be capable of being opened in nearly all cases is larger than the depth of the relevant cabinet, in some cases the provision is made that the guiding rails are not only deflected over 90^{o} at the front of the cabinet, but also near the rear wall of the cabinet. Naturally the useful depth of the cabinet is diminished by this.

In order to prevent this the guiding rails occasionally are also bent over 180^{o} at the rear wall of the cabinet, so that the lamellae are displaced again parallel to the side wall of the cabinet.

For the known roller doors it is to that end required to provide the guiding rails with a substantially radius as otherwise the lamellae will be blocked in the guiding

rails, either on opening or on closing the door. It is obvious that also in this case useful cabinet space is lost.

The invention has as an object to avoid this disadvantage and to provide such a construction that deflecting of the lamellae over 180° from their path occurs in such a way that the radius of curvature of the outer wall of the bent section of the guiding rail extending over about 180° is hardly larger than the width of the front face of the lamellae.

According to the invention this is achieved in that the lamellae are provided with two spaced pivots located behind the front face and near the end edges thereof and being made in such way that the pivots of succeeding lamellae can be slid into each other, a curved guiding plane being formed behind and between the pivots and cooperating with an interior bent wall section of the guiding rail, the leading point of said guiding plane, seen in the direction of movement when opening the door, being located farther away from the front face of the lamellae than the most rearward point of it, said guiding rail immediately before the beginning of the bent section having a narrowing with a smaller internal width than the preceding part but such that no jamming of the lamellae can occur, the bent section joining the narrowing having an increasing width up to over an angle of about 150°, the radius of curvature of the inner wall of the bend being equal to or smaller than the radius of curvature of the curved guiding plane of the lamellae and the radius of curvature of the outer wall of the bend being not more than 25 % larger than the width of the front face of the lamellae, the interior wall of the bent section of the rail, joining the section bent over about 150°, is passing again into the straight section via an only slightly bent section.

It has appeared that by the application of the narrowing the lamellae can be accurately guided just before the beginning of the bend, while there is still a certain play between the lamellae and the guiding rail. If, however,

this small play extends over too large a part of the guiding rail, then it appears that a too large frictional resistance may occur between the lamellae and the rail. As in addition the leading point of the curved guiding plane of the lamellae is spaced further away from the front face of the lamella than the rear point, it is achieved that the guidance of the lamellae mainly occurs by the first mentioned point, whereas only during the returning movement, thus bringing the lamellae towards the closed position, the guiding plane of the lamella cooperates with the inner wall of the bent section of the guiding rail immediately joining the narrowing. In connection therewith the radius of this inner wall is therefore equal to or somewhat smaller than the radius of curvature of the curved guiding plane of the lamellae.

As the inner wall of the bend may have a relatively small radius of curvature, the radius of curvature of the outer wall of the bend does not need to be more than 25 % larger than the width of the front face of the lamellae, as a consequence of which the complete bend near the side wall of the cabinet will occupy little space.

Because finally the strongly bent section of the inner wall of the bend passes again into the straight section via an only slightly bent section, it is achieved that a lamella which after the frist part of the bend is turned over a large angle with respect to the subsequent lamella is gradually returned to a position in which the front faces of the lamellae are in one single plane. During this turning back of the lamella the leading point of the guiding plane of the lamella cooperates with the above mentioned slightly bent section of the inner wall of the bend.

Preferably the length of the narrowing of the guiding rail will be about equal to the width of the front face of the lamellae, the narrowing being applied such that the outer wall of the guiding rail desribes a straight line.

It appears that with such a length and positioning of the narrowing the lamellae, which is just before the bend on opening the door, is accurately brought to the desired place with respect to the bend and with respect to the next lamella, whereby a smooth entering of the lamella into the bend is achieved.

In particular a provision will be made, that the radius of curvature of the inner wall of the bend, immediately joining the narrowing, and the radius of curvature of the guiding plane of the lamellae is about equal to half the width of the front face of the lamellae.

The dimensions of the bend may be decreased even further when that part of the inner wall of the bend immediately joining the narrowing has the above mentioned radius of curvature over about 90^{o}, while the radius of curvature thereafter is decreased by 15 to 20 % over about 60^{o}.

Applying these features the radius of curvature of the outer wall of the bend does not have to be more than 12 % larger than the width of the front face of a lamella.

As far as the lamella as such is concerned, it may be stated that the width of the guiding plane as projected on the front face of the lamella and located behind this is 50 to 60 % of the width of the front face of the lamella, the distance between the leading point of the guiding plane located farthest from the front face and the front face is from 45 to 55 % of the width of the front face of the lamella, the opposite extreme point of the guiding plane lying at a distance from the front face which is from 6 to 10 % smaller than the distance between the leading point and the front face of the lamella.

Preferably the pivot of a lamella, present in front of the guiding plane in the direction of movement when opening the door, is constituted by a bent wall section continuing over at least 240^{o} for enclosing a pinshaped

part as this has been applied at the other side of a lamella for forming the other part of a pivot.

In order to counter elastic deflection of the bent wall section continuing over at least 240° and thus a getting loose of a pivot according to the invention, it can be provided that to the most rearward point of the guiding plane located nearest to the front face of the lamella, a wall section is connected, extending substantially parallel to the front face of the lamella, and being suitable to cooperate with the bent wall section, forming part of a pivot of an adjacent lamella.

The invention will now be further elucidated by means of an embodiment, shown in the drawing, in which:

Fig. 1 schematically shows a vertical section over a straight part of a roller door; and
Fig. 2 shows a horizontal section over a number of lamellae of the door with the related bent section of the inner wall of a guiding rail for the lamellae.

Fig. 1 shows a vertical section over a lamella 1, which is guided by guiding rails 2, running parallel to each other and in horizontal planes, and having a substantially U-shaped cross-section.

The shape of the cross-section of the lamella 1 appears in particular from Fig. 2.

The lamellae have a substantially flat front face 3, which is for example somewhat corrugated or profiled in order to obtain a specific appearance of the outer face of the door in its closed position.

Each lamella has a pinshaped pivot 4 and a bent wall portion 5 located opposite it, which together with a pinshaped pivot of a subsequent lamella forms a hinge.

In order to prevent that the bent wall portion 5 is pulled away from the pinshaped part 4 by elastic deflection an enclosing wall portion 6 is provided opposite the pinshaped pivot 4, such that the bent wall portion 5 is between the pinshaped pivot 4 and the enclosing wall portion 6.

Further each lamella comprises a curved guiding plane 7, provided in such a way that the leading point 8 of this guiding plane is located farther from the front face 3 of the lamella than the rearward point 9 of the guiding plane. In this as the leading point that point is considered that moves in front when the door is slit open. The direction of opening is indicated in Fig. 2 with the arrow V. In the closed position of the door most of the lamellae will thus be positioned in the straight section 10 of the guiding rail 2, to which straight section the bend 11 is connected in such a way that the subsequent straight section 12 of the rail 2 may run substantially parallel to the side wall of a cabinet. The straight section 12 passes via a bent section 13, formed in a special way, into a straight section 14, which may extend up to the vicinity of the straight section 10 of the guiding rail 2. In order to gain as much as possible space at the cleared opening of the cabinet, the straight section 14 of the guiding rail 2 may make a certain angle with the straight section 12 as appears from Fig. 2.

Fig. 2 shows a number of lamellae in the position as these about will occupy on sliding open the door, thus on displacement of the lamellae in the direction of the arrow V, when a force is exerted on the lamellae via an ultimate, specially shaped lamella 1a of the door.

In order to guide the lamellae 1 in the proper way through the guiding rails 2 the guiding rails 2 have an inner width B, which is larger than the largest thickness D of a lamella 1, such that over the greater part of the path of motion of the lamellae 1 these have a substantial play with respect to the side walls of the rail.

For an actual rail this play amounts to about 12 % of the thickness D, while then the width E of a front face 3 of a lamella 1 is about twice as large as the thickness D.

Prior to the beginning of the bent section 13 the straight section 12 of the guiding rail 2 has a narrowed section 15 with a width B1, which is only 4 % larger than the thickness D of a lamella 1, while the length of the narrowing is about equal to the width E of the front face 3 of a lamella. Hereby the lamella 1 is fairly accurately brought in that position, in which the front face 3 of the lamella over its whole width engages the section 16 of the outer wall of the guiding rail just before passing through the bent section 13.

The lamellae moving in front of the latter mentioned lamella are diverted by the section 17 of the outer wall of the bent section 13, whereby the lamellae 1B and 1C are turned over nearly the maximum angle with respect to each other. On further sliding of these lamellae they will try to maintain the same position with respect to each other, but this is compensated in that the leading point of the lamella 1C or of a lamella 1D preceding it, will engage a nearly straight extending section 18 of the inner wall of the guiding rail 2. By this the lamella 1D is turned back with respect to the lamella 1C, so that for example the front faces of the successive lamellae 1D and 1E will come to ly in one plane again.

Thereto the radius R of the outer wall 17 of the bent section 13 has to be only about 12 % larger than the width E of the front face of a lamella, so that the turning over of the lamellae over somewhat more than 180^{o} can take place within a very limited space.

As appears from Fig. 2 the curvature of the section 17 of the bend 13, joining the outer wall 16, starts somewhat later than the curvature of the inner wall 19, such that the distance between the outer wall and the inner

wall of the guiding rail, viewed in the direction of motion V of the lamellae, increases gradually over an angle of about 150° to decrease thereafter again gradually till the width B.

The position which the lamellae occupy on closing the door again, thus when moving the leading lamella 1a in a direction opposite to the direction V, is not shown in the drawing.

However, it will be obvious that in that case the lamellae will just be pulled towards the inner wall 19 of the bend 13 and it has appeared to be of special importance that the radius S of the first portion of the bent section 13 is substantially equal to the radius S of the guiding plane 7 of a lamella 1.

In the actual embodiment mentioned earlier the radius S was substantially equal to the thickness D of a lamella. The inner wall 19 of the bent section 13 joining the part with radius S and extending over about 90°, has a radius T which is about 20 % smaller than the radius S.

It has appeared, that in this way a good guidance of the lamellae through the bent section 13 of the guiding rails 2 is obtained, also during the returning movement of the lamellae thus on closing the door, such that during closing the door no impacts occur in consequence of the varying frictionial and resistance forces, which are dependent on the specific positions of the lamellae at any moment of their movement with respect to the guiding rail especially in the described bent sections 17 and 13. In case of the shape and relationship of the cooperating lamellae and guiding rail as described above these forces appear to remain substantially constant both during opening and closing of the door, because the sum of the forces exerted on any individual lamella remains substantially the same during the movements.

It will be obvious that tolerances in the dimensions of the lamellae and the guiding rails have to be taken into

account and that also the pivots of the lamellae can be carried out in a different manner. Of course many modifications can be made without being beyond the scope of the invention.

- C l a i m s -

1. Roller door comprising a number of mutually hingedly connected extended lamellae (1) and guiding rails (2) positioned at the ends of the lamellae, in which these ends are inserted and extend themselves in a distance from and parallel to each other along two sides of the door opening and comprise bent parts (11,13) to bring the lamellae (1) outside the plane of the door opening on opening the door, said lamellae (1) having a substantially flat front face (3) such that the front faces (3) of the lamellae (1) substantially link up with each other in the closed position of the door, the hinge parts (4,3) of the lamellae (1) being connected with that flat front face (3) characterized in
that the lamellae (1) are provided with two spaced pivots (4,5) located behind the front face (3) and near the end edges thereof and being made in such way that the pivots (4,5) of succeeding lamellae can be slid into each other, a curved guiding plane (7) being formed behind and between the pivots (4,5) and cooperating with an interior bent wall section (19) of the guiding rail (2), the leading point (8) of said guiding plane (7), seen in the direction of movement (V) when opening the door, being located farther away from the front face (3) of the lamellae (1) than the most rearwar point (9) of it, said guiding rail (2) immediately before the beginning of the bent section (13) having a narrowing (15) with a smaller internal width (B1) than the preceding part (12) but such that no jamming of the lamellae (1) can occur, the bent section (13) joining the narrowing (15) having an increasing width up to over an angle of about 150°, the radius of curvature (S,T) of the inner wall (19) of the bend (13) being equal to or smaller than the radius of curvature (S) of the curved guiding plane (7) of the lamellae (1) and the radius of curvature (R) of the outer wall (17) of the bend (13) being not more than 25 % larger than the width (F) of the front face of the lamellae (1), the interior wall (19) of the bent section of the rail (2) joining the section (18) bent

over about 150°, is passing again into the straight section (14) via an only slightly bent section.

2. Roller door according to claim 1, characterized in that the length of the narrowing (15) of the guiding rail (2) is about equal to the width (E) of the front face of the lamellae (1), the narrowing (15) being applied such that the outer wall (16) of the guiding rail (2) describes a straight line.

3. Roller door according to claim 1 or 2, characterized in that the radius of curvature (S) of the inner wall (19) of the bend (13), immediately joining the narrowing (15) and the radius of curvature (S) of the guiding plane (7) of the lamellae (1) is about equal to half the width (E) of the front face of the lamellae (1).

4. Roller door according to claim 3, characterized in that that part of the inner wall (19) of the bend (13) having a radius of curvature (S) about equal to half the width (E) of the front face of the lamellae extends over about 90°, while the radius of curvature (T) of the succeeding part is 15 to 20 % smaller and extends over about 60°.

5. Roller door according to claim 4, characterized in that the radius of curvature (R) of the outer wall (17) of the bend (13) is not more than 12 % larger than the width (E) of the front face of a lamella (1).

6. Roller door according to one of the preceeding claims, characterized in that the width of the guiding plane (7) as projected on the front face (2) of the lamella (1) and located behind this is 50 to 60 % of the width (E) of the front face (3) of the lamella (1), the distance between

the leading point (8) of the guiding plane (7) located farthest from the front face (3) and the front face (3) is from 45 to 55 % of the width (E) of the front face of the lamella (1), the opposite extreme point (9) of the guiding plane (7) lying at a distance from the front face (3) which is from 6 to 10 % smaller than the distance between the leading point (8) and the front face (3) of the lamella (1).

7. Roller door according to one of the preceeding claims, characterized in
that the pivot (5) of a lamella (1), present in front of the guiding plane (7) in the direction of movement (V) when opening the door, is constituted by a bent wall section (5) continuing over at least 240° for enclosing a pinshaped part (4) as this has been applied at the other side of a lamella (1) for forming the other part of a pivot.

8. Roller door according to claim 7, characterized in
that to the most rearward point (9) of the guiding plane (7) located nearest to the front face (3) of the lamella (1) a wall section (6) is connected, extending substantially parallel to the front face (3) of the lamella (1), and being suitable to cooperate with the bent wall section (5) forming part of a pivot (4,5) of an adjacent lamella.

0212009

FIG.2

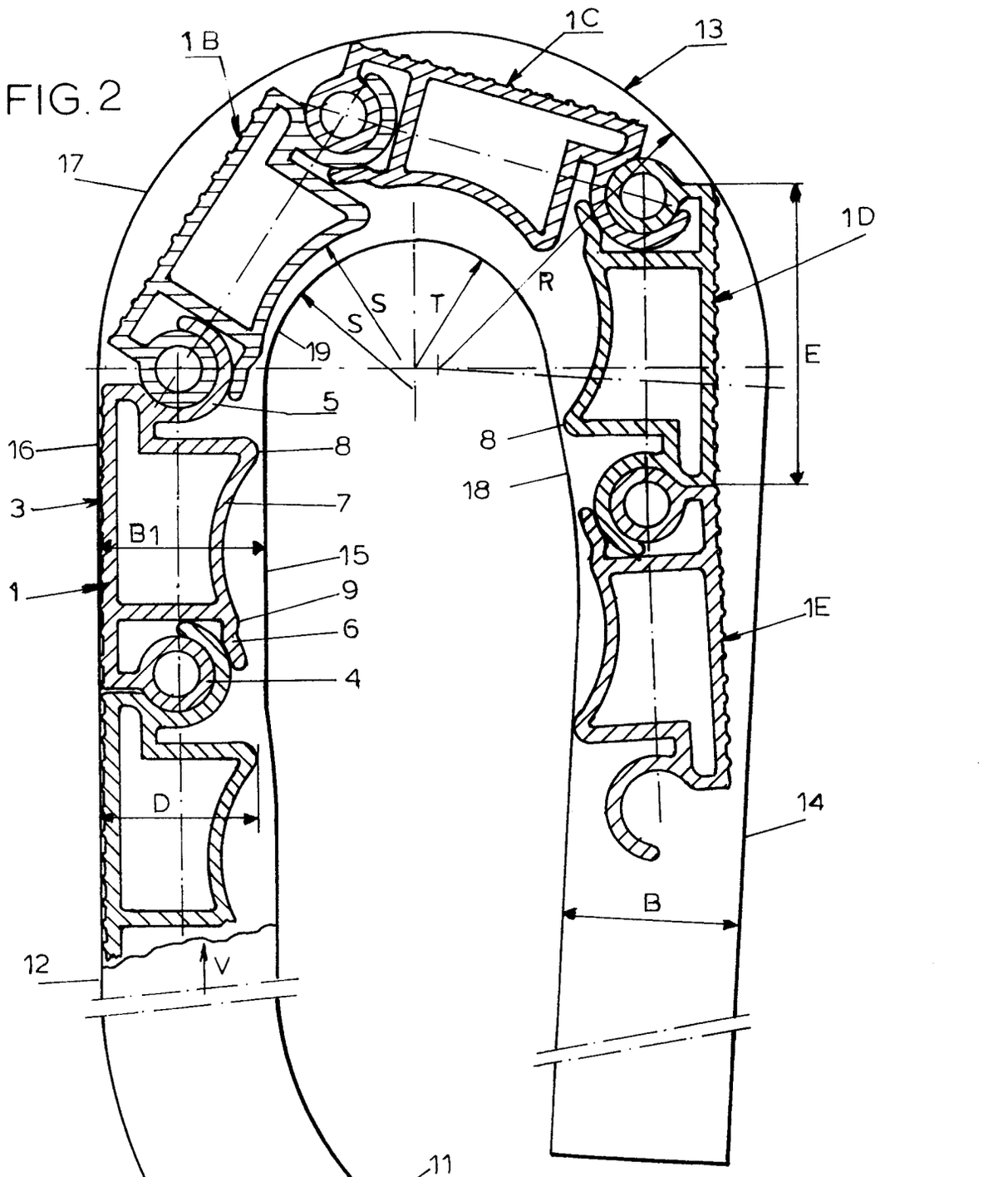


FIG.1