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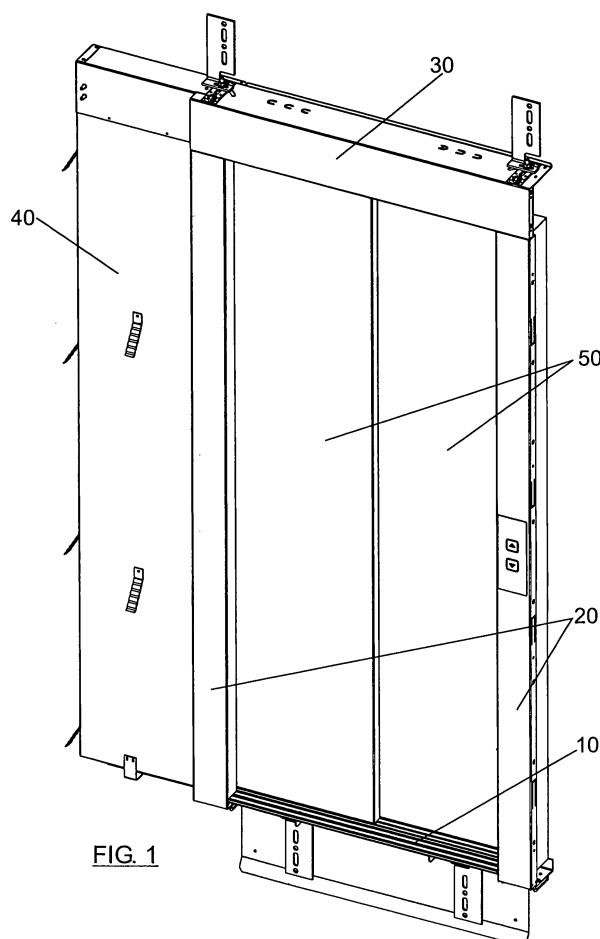
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(54) **Automatic elevator door and method of assembling it**

(57) The invention relates to an automatic elevator door and method of assembling it associated with a new frame, comprising a frame formed by:
a tread assembly [10];

a plurality of stringers [20];
a crosshead assembly [30];
allowing a quick and simple assembly due to its modularity.



Description

Object of the Invention

[0001] The object of the present patent of invention is to set forth a new automatic elevator door, including a new automatic elevator door frame and a new method of assembling said door, corresponding to those of the type comprising a frame fixed to the construction wall or self-supporting structures and a door comprising one or several leaves.

Background of the Invention

[0002] Automatic elevator doors and their assembly are currently carried out as follows:

The frame is generally provided disassembled; the following step is to place it horizontally on the floor, with the visible face thereon, and adjusting the different parts of said frame according to the position of the holes for the screws. Two operators are necessary to complete the operation. Apart from this, this operation is complicated and the frame is easily damaged due to the need to place the frame on a generally dirty construction floor.

[0003] The process of fitting the frame once it is assembled on the floor is complicated and dangerous because one of the operators works in the shaft of the elevator. In the same way, the quality of the assembly derives to a great extent from the experience of the operators, because there is no provision with respect to its self-centering, the frame being placed with a plummet during the work without a clear reference.

[0004] There are several documents in the state of the art relating to methods for assembling elevators, amongst which European patent document EP0345322 stands out, completely describing the assembly of the elevator in the shaft provided for that effect. Nevertheless, it does not specifically describe the elevator door and its assembly, which are the objects of the present invention.

Description of the Invention.

[0005] The automatic elevator door and the method of assembling it, object of the present invention, are set forth to palliate or where appropriate, eliminate the drawbacks mentioned above.

[0006] The elevator door is of the type comprising at least one frame fixed to the civil construction wall or self-supporting structure and one or several leaves assembled in said frame. Said method of assembling the elevator door further comprises at least:

a first step of fixing the frame to the wall or self-supporting structure, and

a second step of placing and adjusting the leaf or leaves forming the door. Wherein the first step of fixing the frame to the wall or self-supporting structure comprises at least the steps of assembling the tread assembly, assembling the stringer assembly, assembling the crosshead assembly, placing the cover of the stringer and, optionally assembling the leaf protector.

[0007] The second step of placing and adjusting the leaf or leaves forming the door comprises at least the following steps,

a first step of placing and adjusting the leaves, a second step of checking the electromechanical locking, a third step of removing the protective film of the mechanism, a fourth step of placing the foot guard plate, a fifth step of placing the slides, and a sixth step of final verification.

[0008] The following advantages with respect to the current state of the art are obtained by means of the door and method thus described:

- Self-positioning of the frame components, with the correct relative position between the four frame components, tread, opening stringer, closing stringer and crosshead, being ensured thanks to the telescopic coupling system without needing prior joints fixing their relative position.
- Possibility of vertical assembly and from the inside of the elevator shaft, and therefore, it does not require free space in areas close to the installation site for assembling the door frame.
- Vertical assembly of the frame, minimizing the risk of dirtying and damaging the components which would otherwise have to be positioned on the floor to assemble them.
- Very quick assembly, minimizing the assembly time, because apart from the self-adjustment of the components, screwed joints are not required, although the fixing of the frame for its transport can be ensured assembled with a minimum number of screwed joints, not greater than 4.
- The modular type method of assembling allows a single operator to completely assemble and install the door quickly and safely, without handling bulky and heavy components.

Brief Description of the Drawings

[0009] A set of drawings is very briefly described below which aid in better understanding the invention and are expressly related to an embodiment of said invention which is set forth as a non-limiting example thereof.

Figure 1 shows a view of the elevator door assembly once it has been assembled.

Figure 2 shows an image of the tread assembly.

Figure 3 shows an image of the stringer assembly.

Figure 4 shows an image of the crosshead assembly.

Figure 5 shows a view of the leaf protector.

Preferred Embodiment of the Invention.

[0010] As can be seen in Figure 1, the elevator door is of the type comprising at least one frame fixed to the civil construction wall or self-supporting structure and one or several leaves assembled in said frame. Said method of assembling the elevator door further comprises at least:

a first step of fixing the frame to the wall, and
a second step of placing and adjusting the leaves forming the door.

[0011] In the first step of fixing the frame to the wall, the tread assembly must be first fixed in the shaft. Said tread assembly comprises at least:

means for supporting the tread;
a tread profile;
a plurality of supports for the stringers;
a plurality of means for joining and fixing the assembly, preferably screws.

And wherein the fixing of the tread assembly in the shaft first comprises placing fixing squares according to the demand and projection of the door, fixing them to the wall through one of the vertical slits of said square using a fixing block. The tread assembly is subsequently placed on said frames and adjusted such that the following is complied:

The tread assembly is leveled;
The tread assembly is correctly placed with respect to the cabin tread support by moving the tread assembly until it abuts against the cabin tread support, ensuring a separation gap between treads through a means selected from:

gages;
aligning tool,

The means for fixing the tread assembly to the fixing squares are firmly fixed to the wall.

[0012] Once the tread has been adjusted and it has been checked that its alignment coincides with the cabin, a second fixing block will be placed in each of the squares, for the purpose of fixing the assembly.

[0013] After assembling the tread assembly, the step of joining the stringers will be carried out. Said stringers comprise at least,

one first closing stringer comprising at least:

one profile open in one of its faces,
one closing cover, and
one or several reinforcing plates;

one second closing stringer, comprising at least:

one profile open in one of its faces,
one or several reinforcing plates.

Wherein the joining of the stringers to the tread assembly first comprises a first step of fitting the stringers in the tread assembly until verifying that they make contact with the entrance stop, each joint can subsequently be reinforced by means of a screwed fixing. The stringers are subsequently placed and riveted to the tread assembly.

[0014] The crosshead is assembled after the stringers. Said crosshead comprises at least,
one profile open in one of its faces,
means for joining to the stringers, comprising,
means for joining to the closing stringer, and
means for joining to the opening stringer,
and one or several carriages which can move on a plurality of guides, the number of carriages depending on the number of leaves comprised by the door.

[0015] Subsequently, a plurality of squares are provisionally fixed to the crosshead profile in its upper part, and the crosshead assembly is mounted on lifting means and is lifted until the upper ends of the stringers are below the crosshead, with a sufficient distance to allow the assembly; the crosshead will subsequently be fitted abutting on the stringers, thanks to the means for joining said stringers, verifying that both the crosshead and the crosshead supplement make contact with the stringer, pushing the crosshead and/or crosshead supplement downwards if necessary; each joining to the stringer can subsequently be reinforced by means of a screwed fixing; the cabin platform can be lifted up to the upper height of the crosshead in order to align and plumb the crosshead assembly; with the gage or aligning tool fixed to the upper edge of the crosshead, the assembly will be moved until it abuts against the cabin tread support, thus ensuring the verticality and planar level of the door by means of the same separation gap between the cabin and floor door treads, and the crosshead and cabin tread; furthermore, if necessary, the crosshead assembly will be slightly moved to the right or the left, until verifying, with the aid of gage marks, that the alignment of the entrance opening coincides with the side edges of the cabin tread support; maintaining the alignment position, and once the means for fixing the crosshead assembly to the fixing squares are firmly fixed to the wall, such squares will be fixed to the wall or self-supporting structure; the cover of the closing stringer will then be placed, fitting it in the heads of its screws, adjusting it and screwing. After a correct alignment of the crosshead, the cover of the stringer will be placed, fitting it in said stringers, adjusting it and fixing it

by means of screws.

[0016] In a preferred embodiment of the invention, the elevator door object of the invention comprises leaf protecting means, the latter comprising at least, one protector formed by an L-shaped sheet, a plurality of fixing clamps, and a plurality of squares, wherein the fixing clamps are riveted on the protector. The squares are then screwed to the tread assembly and the rivets of the leaf protector are placed in the stringer, crosshead and tread assemblies, always riveting them from the inner part of the shaft.

[0017] In the second step of placing and adjusting the leaves forming the door, the leaves must first be placed and adjusted, this step in turn comprises, a first step of introducing the slow leaf, introducing the lower part in the channel of the tread closest to the landing, shifted at least 40 mm in the opening direction to prevent interferences between flame trap labyrinths, with the leaf already vertical, it is moved to its position and hung from the hooks of the carriage; a second step of introducing the fast leaf, introducing the lower part in the channel of the tread closest to the cabin, shifted about 200 mm in the opening direction. With the leaf already vertical, it is moved to its position passing behind the plate of the driving wheels, and hung from the hooks of the carriage; a third step of fixing the doors through eccentric hangers, with the less eccentric face upwards; a fourth step of adjusting the leaves, comprising, a vertical adjustment, acting on the hexagonal hangers, if the leaves are not vertically aligned upon opening the door, a horizontal adjustment, adjusting the forward movement on the hangers in the event that the leaves are not flush with the opening stringer with the door open.

[0018] After placing and adjusting the leaves, the electromechanical locking is checked, said checking comprising, a first step of verifying the locked door at rest, where it is checked that the fast carriage moves in the opening direction, at least 2 mm before the mechanical locking occurs, a second step of checking the emergency unlocking, checking that the slow door opens when it is pushed, with the key being turned.

[0019] After this checking, the protective film of the mechanism will be removed, and the foot guard plate and the slides will be placed, such slides being placed in the grooves of the tread assembly.

[0020] The correct operation of the assembly, including the emergency closing, will finally be verified.

Claims

1. An elevator door, of the type comprising at least one frame fixed to civil construction wall or self-support-

ing structure and one or several leaves assembled on said frame, **characterized in that** the frame comprises at least:

one tread assembly, comprising in turn,

means for supporting the tread;
a tread profile;
a plurality of supports for the stringers;
a plurality of means for joining and fixing the assembly,

a plurality of stringers, comprising in turn,

a first closing stringer comprising at least:

one profile open in one of its faces,
one closing cover, and
one or several reinforcing plates;

a second opening stringer comprising at least:

one profile open in one of its faces,
one or several reinforcing plates

and a crosshead assembly, comprising in turn,

a profile open in one of its faces,
means for joining to the stringers, comprising,

means for joining to the closing stringer, and
means for joining to the opening stringer,

a carriage which can move on a plurality of guides, wherein there will be as many carriages as leaves forming the door.

2. An elevator door according to claim one, **characterized in that** it comprises leaf protecting means, such means comprising at least,

one protector formed by an L-shaped sheet,
a plurality of fixing clamps, and
a plurality of squares,

wherein the fixing clamps are riveted on the protector, and the squares are screwed to the tread assembly, the rivets of the leaf protector being riveted in the stringer, crosshead and tread assemblies.

3. A method of assembling the elevator door of claim one, **characterized in that** it comprises at least:

a first step of fixing the frame to the wall or self-

- supporting structure, and
a second step of placing and adjusting the
leaves forming the door;
- and wherein the first step of fixing the frame to the
wall or self-supporting structure comprises in turn,
- a first step of placing the tread assembly,
a second step of placing the stringers,
a third step of placing the crosshead assembly;
- and wherein the second step of placing and adjusting
the leaves forming the door comprises
- a first step of placing and adjusting the leaves,
a second step of checking the electromechanical
locking,
a third step of removing the protective film of the
mechanism,
a fourth step of placing the foot guard plate,
a fifth step of placing the slides,
and a sixth step of final verification.
4. A method of assembling an elevator door, according
to claim three, **characterized in that** assembling
the tread assembly in the shaft first comprises plac-
ing fixing squares, fixing them to the wall through
one of the vertical slits of said square, using a fixing
block; the tread assembly is subsequently paced on
said squares and adjusted such that the following is
complied:
- the tread assembly is leveled;
the tread assembly is correctly placed with re-
spect to the cabin tread support by moving the
tread assembly until it abuts against the cabin
tread support, ensuring a separation gap be-
tween treads through a means selected from:
- gages;
aligning tool,
- and the means for fixing the tread assembly to
the fixing squares are firmly fixed to the wall,
- and wherein once the tread has been adjusted and
it has been checked that the alignment coincides with
the cabin, a second fixing block will be placed in each
of the squares in order to fix the assembly.
5. A method of assembling an elevator door, according
to claim three, **characterized in that** the joining of
the stringers to the tread assembly first comprises a
first step of fitting the stringers in the tread assembly
until verifying that they make contact with the en-
trance stop, each joint can subsequently be rein-
forced by means of a screwed fixing; and wherein
the stringers are subsequently placed in the tread

assembly.

6. A method of assembling an elevator door, according
to claim three, **characterized in that** a plurality of
squares are provisionally fixed to the crosshead pro-
file in its upper part, and the crosshead assembly is
mounted on lifting means and is lifted until the upper
ends of the stringers are below the crosshead, with
a sufficient distance to allow the assembly; the cross-
head will subsequently be fitted abutting on the
stringers, thanks to the means for joining said string-
ers, verifying that both the crosshead and the cross-
head supplement make contact with the stringer,
pushing the crosshead and/or crosshead supple-
ment downwards if necessary; each joining to the
stringer can subsequently be reinforced by means
of a screwed fixing; the cabin platform can be lifted
up to the upper height of the crosshead in order to
align and plumb the crosshead assembly; with the
gage or aligning tool fixed to the upper edge of the
crosshead, the assembly will be moved until it abuts
against the cabin tread support, thus ensuring the
verticality and planar level of the door by means of
the same separation gap between the cabin and floor
door treads, and the crosshead and cabin tread; fur-
thermore, if necessary, the crosshead assembly will
be slightly moved to the right or the left, until verifying,
with the aid of gage marks, that the alignment of the
entrance opening coincides with the side edges of
the cabin tread support; maintaining the alignment
position, and once the means for fixing the cross-
head assembly to the fixing squares are firmly fixed
to the wall, such squares will be fixed to the wall or
self-supporting structure; the cover of the closing
stringer will then be placed, fitting it in the heads of
its screws, adjusting it and screwing.
7. A method of assembling an elevator door, according
to claim three, **characterized in that** in one config-
uration of the door with at least one fast leaf and one
slow leaf, the first step of placing and adjusting the
leaves comprises,
- a first step of introducing the slow leaf, introduc-
ing the lower part in the channel of the tread
closest to the landing, shifted at least 40 mm in
the opening direction to prevent interferences
between flame trap labyrinths, with the leaf al-
ready vertical, it is moved to its position and hung
from the hooks of the carriage;
- a second step of introducing the fast leaf, intro-
ducing the lower part in the channel of the tread
closest to the cabin, shifted about 200 mm in the
opening direction, with the leaf already vertical,
it must be moved to its position passing behind
the plate of the driving wheels, and hung from
the hooks of the carriage;
- a third step of fixing the doors through the ec-

centric hangers, with the less eccentric face upwards.

a fourth step of adjusting the leaves, comprising,

a vertical adjustment, acting on the hexagonal hangers, if the leaves are not vertically aligned upon opening the door, 5
a horizontal adjustment, adjusting the forward movement on the hangers in the event that the leaves are not flush with the opening stringer with the door open. 10

8. A method of assembling an elevator door, according to claim three, **characterized in that** the second step of checking the electromechanical locking comprises, 15

a first step of verifying the locked door at rest, where it is checked that the fast carriage moves in the opening direction, at least 2 mm before the mechanical locking occurs, 20
a second step of checking the emergency unlocking, checking that the slow door opens when it is pushed, with the key being turned.

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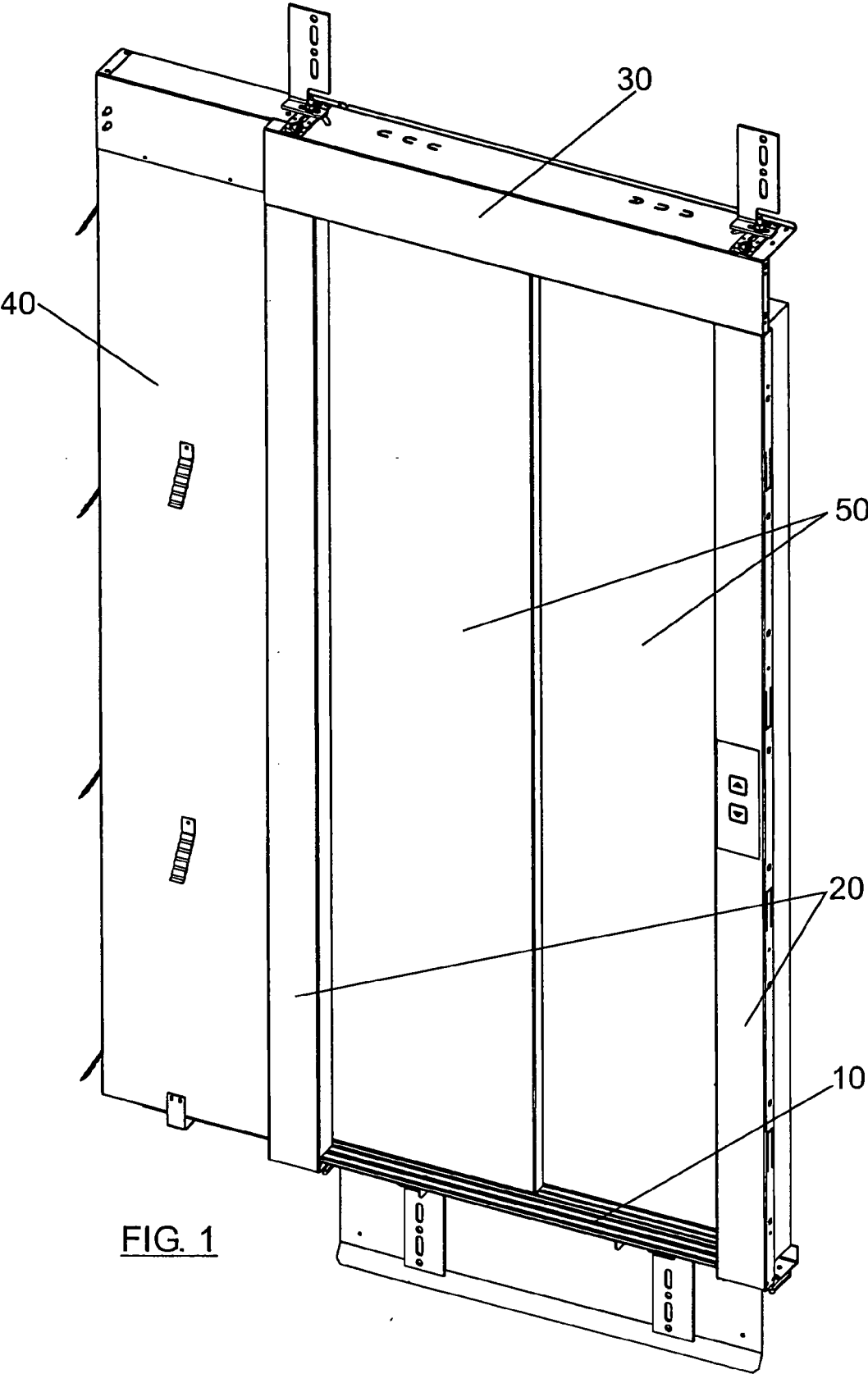
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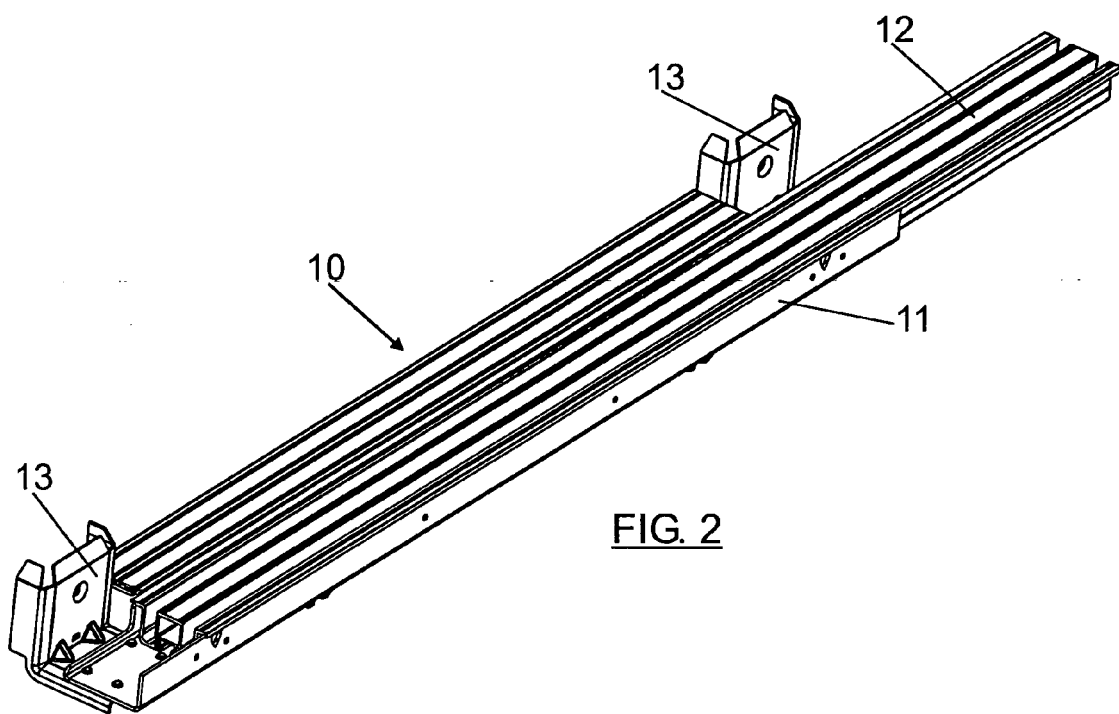
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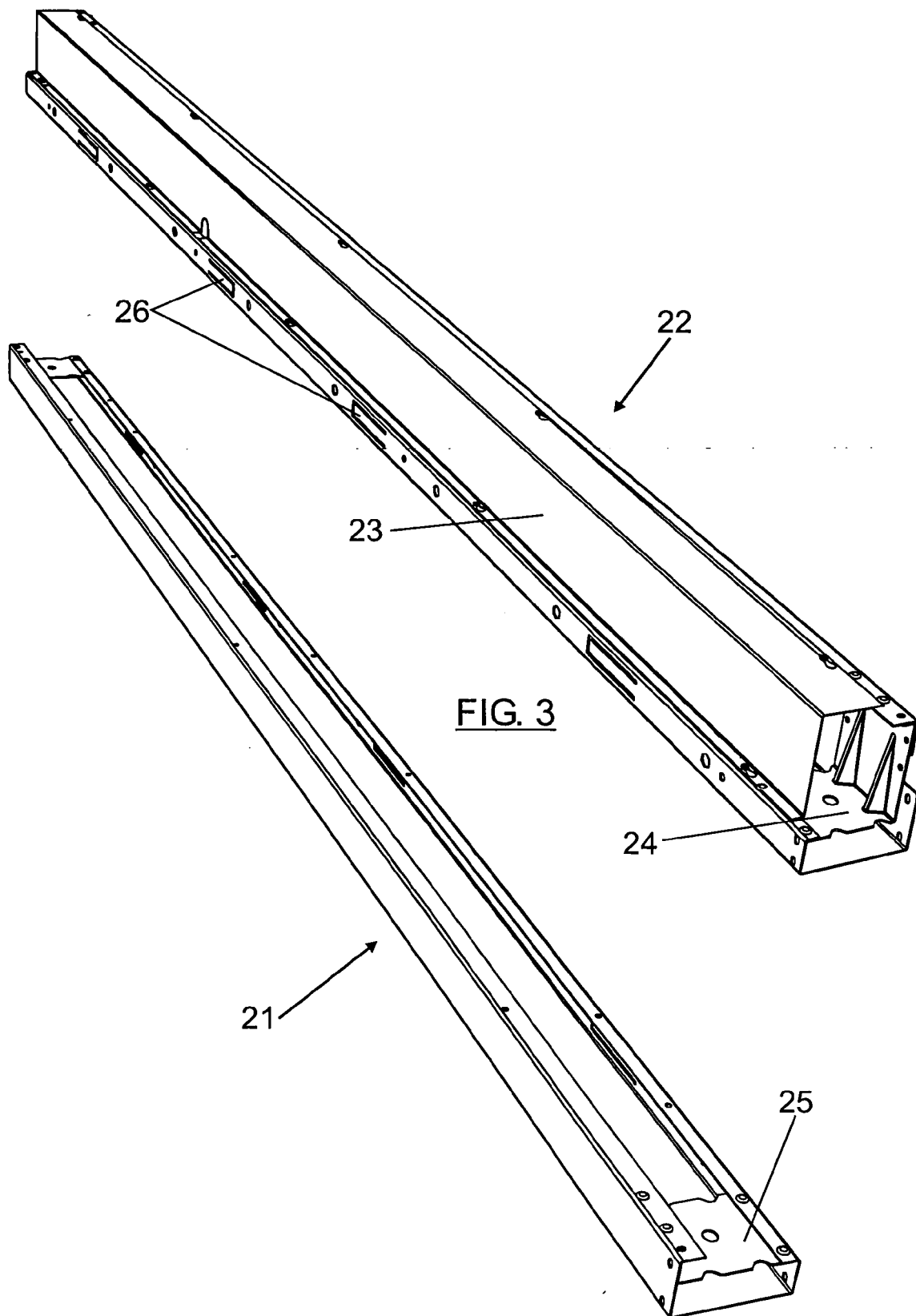
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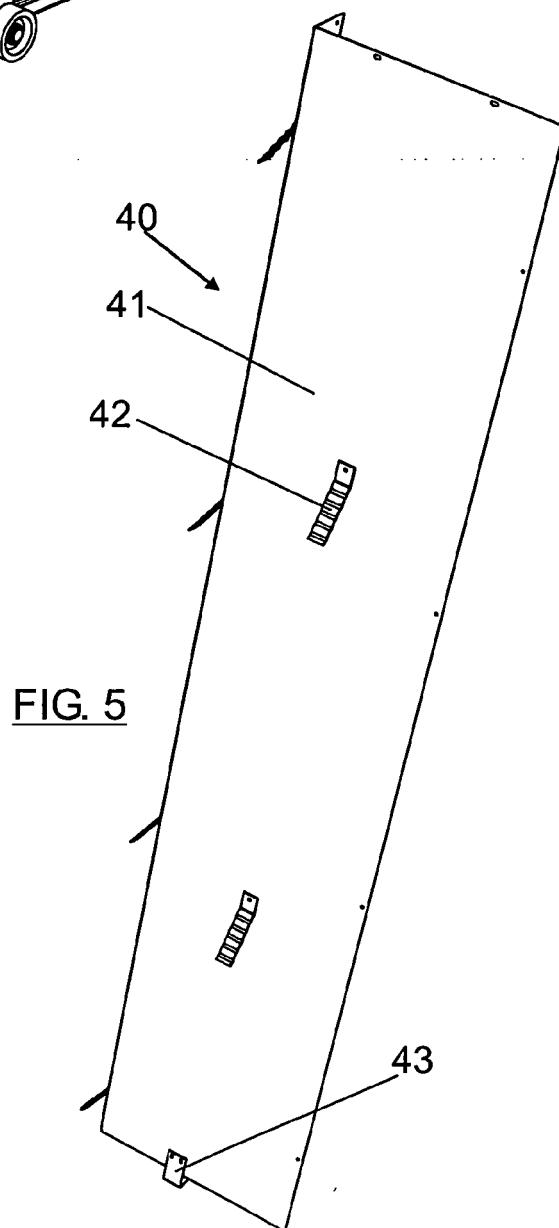
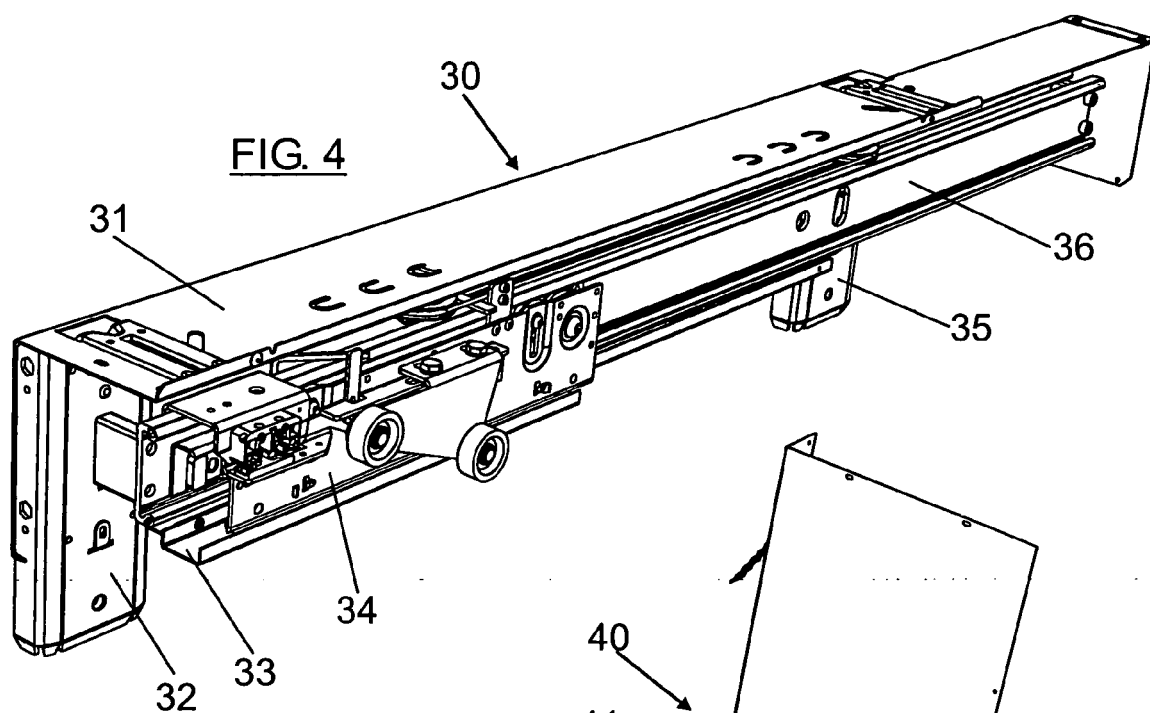
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Application Number
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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