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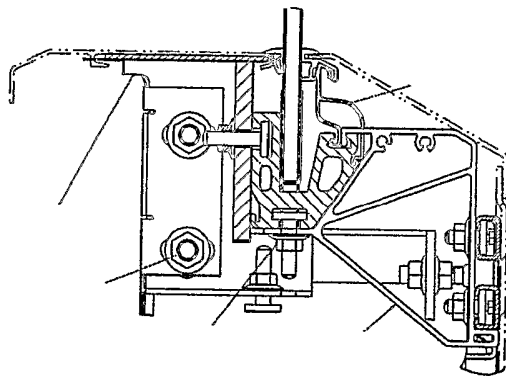
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Published:

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: BALUSTRADE FASTENING ARRANGEMENT



(57) Abstract: A balustrade fastening arrangement for an escalator or passenger conveyor having a moveable skirt panel whereby the fastening arrangement secures an inner decking panel such that it overhangs the moving skirt panel between the skirt panel and the step.

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BALUSTRADE FASTENING ARRANGEMENT

The present invention is concerned with passenger conveyor systems, such as escalators and moving walkways.

A typical passenger conveyor, such as an escalator or moving walkway, includes a frame, balustrades with moveable handrails, treadplates or steps, a drive system and a step chain for propelling the treadplates. The frame includes a truss section on both the left and right hand side of the frame. Each truss section has two end portions forming landings, connected by an inclined midsection.

To provide support and safety for the passengers, passenger handrails are provided travelling in the same direction and speed as the steps. A balustrade assembly supports and guides a handrail on each side of the steps.

Each balustrade assembly includes a balustrade panel (which, in many modern escalators, is a glass panel). This extends up from a base to support the handrail. Externally, the base consists of an outer decking, an inner decking and a skirt panel. The outer decking encloses the mechanics on the side of the balustrade panel opposite the moving treadplates or steps. The inner decking encloses the mechanics adjacent the moving steps and also provides a transition section between the balustrade panel and the skirt panel.

The skirt panel is provided to cover some of the elevator system components and to prevent objects being caught between the moving steps and the stationary system structure. This risk is greatest at transition

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zones such as near landings.

Generally, the skirt panel lies in close proximity to, but out of contact with the moving step plates.

5

Various steps have been taken to reduce the space between the skirt panel and the step including using special materials and/or surface coatings to produce a low-friction balustrade skirting.

10

In such standard escalator systems, a fastening arrangement is provided to hold the balustrade and the various panels and decking arrangement in place securely. As far as the inner decking is concerned, this is generally held in place by a balustrade bracket arrangement as will be described in more detail below, and is then fixedly attached to the stationary skirt panel, usually by means of bolts. The skirt panel itself is also fixedly attached in place by bolts, attached to the balustrade brackets.

20

This arrangement minimises the risk of objects being caught between the escalator mechanism and the steps, due to the presence of the skirt and the fact that the inner decking is fastened to the balustrade at the top and bottom of the inner decking panel.

25

There have recently been moves to modify the skirt panel so as to eliminate relative motion between various moving parts of the escalator system close to where the passenger stands and to guard against the possibility of objects becoming caught or entrapped at the interface of the moving parts in an escalator system.

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One solution to this problem has been to provide a moving skirt panel which moves together with the steps. An example of such a moveable panel is disclosed in WO

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02/44071.

Another solution, taught in US 6,213,278 replaces the skirt panel with guard panels attached to the steps.
5 The inner decking panel overhangs the guard panels.

Whilst these moveable skirt or guard panels have advantages in terms of preventing objects becoming caught between the moveable steps and the other parts of
10 the escalator system, because the skirt or guard panel moves together with the steps, it is not possible to attach the stationary balustrade panels, e. g. the inner decking, to the skirt. Thus, it is not possible, as in previous escalator systems, for the inner decking to be
15 attached at both of its ends to the stationary escalator structure for stability.

The aim of the present invention, therefore, is to provide a balustrade fastening system which allows
20 secure fastening of the inner decking in a case where the elevator system has a moveable skirt.

It is also an aim of the present invention to provide a fastening arrangement which allows the inner
25 decking panel to be securely attached to the balustrade assembly in such a manner that any clearance which would allow objects to become trapped is minimised, even when the escalator has a moving skirt.

Accordingly, the present invention provides, in one aspect, a balustrade fastening arrangement comprising means for supporting a balustrade panel, said means for supporting being attachable to the frame of an escalator or passenger conveyor, said means for supporting further
30 comprising a bracket extending therefrom adapted to be fixedly attached to an inner decking profile extending from the balustrade panel.
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According to a second aspect, there is provided a balustrade assembly for an escalator or passenger conveyor, the assembly comprising a balustrade panel, a balustrade holder attaching the balustrade, in use, to a frame of the escalator or passenger conveyor, an inner decking profile extending inwardly and downwardly from the balustrade; an outer decking profile extending outwardly from the balustrade from a point opposite the outward edge of the inner decking profile, characterised in that the balustrade holder is formed with a slot to receive the base portion of the balustrade and means for securing the balustrade in the slot; and further comprising a bracket attached at one end to the balustrade holder and extending to be fixedly attached to the inner decking profile at at least one point downwards of the balustrade.

In another aspect, the present invention comprises an escalator or passenger conveyer comprising a truss, a balustrade disposed inward of the truss, a step disposed inward of the balustrade, a balustrade holder attaching the balustrade to the truss, an inner decking profile extending inwardly and downwardly from the balustrade towards the step, an outer decking profile extending outwardly from the balustrade from a point opposite the outward edge of the inner decking profile; a skirt located outwardly out of the step and attached thereto for movement therewith, and a balustrade fastening means comprising a bracket for attachment to said truss and attachment to said inner decking profile, said bracket being configured such that said inner decking profile, when attached to said bracket, overlaps said skirt between said skirt and said step.

Preferred embodiments of the invention will now be described by way of example only and with reference to the drawings.

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Figure 1 shows a part-section view of an escalator;

Figure 2 shows a section through a standard escalator with a fixed skirt;

Figure 3 shows a bracket fastening arrangement for a fixed skirt such as shown in Figure 2;

Figure 4 shows a schematic view of an escalator having a moving skirt into which the present invention can be incorporated and

Figure 5 is a section through a fastening arrangement of the present invention.

Figures 1 to 3 will now be described by way of background.

Figure 1 shows an escalator having a frame or truss 10, a plurality of moving steps 12 and a pair of balustrade assemblies 14. The steps 12 are connected to a step chain 16 which is driven around a continuous path by an electric drive motor 18. On each side of the steps 12, a handrail 19 is driven in the same direction and speed as the steps 12. The handrails 19 enable the passengers (not shown) to steady themselves while riding the escalator.

Figure 2 shows a balustrade skirt panel 24 in relation to an escalator step 12 which is provided on the outside of the panel. A truss member 26 is disposed behind or on the inside of the skirt panel for supporting various escalator components. The skirt panel is suitably attached at its upper edge 28 and near its bottom edge 30 to stationary escalator components 32 and 34 such as braces, decking profiles etc.

As would be seen, in such prior art systems, the skirt panel 24 is fixedly attached to the elevator truss or frame and is stationary relative to the movement of the steps.

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Figure 3 shows an example of a balustrade fastening arrangement which holds the various balustrade components including the decking profiles etc. in place.

5 Each balustrade assembly 14 includes a balustrade panel 20 which extends up from a base 22 to support and guide the handrail 19. Externally, the base consists of an outer decking 36, an inner decking 38 and a skirt panel 24. The outer decking 36 encloses the mechanics
10 (not shown) on the side of the balustrade panel 20 opposite the moving steps 12. The inner decking 38 encloses the mechanics (not shown) adjacent the moving steps 12 and provides a transition section between the balustrade panel 20 and the skirt panel 24.

15 The skirt panel 24 is fixedly attached to the frame or truss 10 e. g. by means of bolts 40. The inner decking 38 is fixedly attached to the fixed skirt panel e. g. by means of a bolt 41.

20 Although not shown in detail in Figure 3, the upper end of the inner decking 38 is also fixedly held in place around the balustrade panel 20 by means of a similar bolt arrangement. This is known in the art
25 (see, e. g., US 4,690,264) and will not be described here in further detail.

 As mentioned above, a new generation of escalators has now been developed to provide several improvements
30 over existing escalator systems. Some of these improvements are described in, e. g. WO 02/44071. The modification provided in these new systems which is relevant to the present invention is the feature of a moving skirt 42 instead of a fixed skirt.

35 As discussed above, one important issue presented by passenger conveyer systems such as escalators is the

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risk of objects being caught between the moving steps and the stationary system structure.

5 Previous escalator systems have attempted to deal with this problem by provision of a stationary skirt panel as mentioned above and as described, for example, in US 4,669,597. Stationary skirt panels do not, however, eliminate relative motion although they do cover some of the elevator system components. Moveable
10 skirt panels have been proposed, but none have been successfully implemented in the market place. An example is shown in US patent no. 4,470,497 which describes a two-piece skirt guard arrangement. This arrangement has not, however, proven successful in the
15 marketplace.

The moving skirt arrangement such as described in WO 02/44071 addresses the problem of the prior art by providing a skirt which is formed of components 42
20 attached to the steps 12 and/or to the drive chain of the escalator steps 12 as shown schematically in Figure 4 so as to move with the steps. This arrangement reduces the amount of relative motion between parts of the escalator and also provides a reduced clearance
25 between the moving parts. Relative motion between components does not, therefore, pull objects into the space and this relative motion is, in the moving skirt arrangement, actually moved away from the area where the passengers stand.

30

There is still a need to provide an inner decking to cover up the machine components on the elevator step side of the balustrade. As discussed above, in prior art systems, with a stationary skirt 24, the inner
35 decking 38 has been securely attached to the stationary skirt and, in preferred arrangements, around the balustrade panel itself.

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With the moving step arrangement it is not, however, possible to fasten the bottom of the inner decking panel to the skirt panel 42.

5 It is an aim of the present invention, therefore, to provide a fastening arrangement which allows the inner decking panel to be securely attached to the balustrade assembly in such a manner that any clearance which would allow objects to become trapped is
10 minimised, even when the escalator has a moving skirt.

Figure 5 shows an example of a balustrade fastening arrangement according to the present invention.

15 The fastening arrangement of the present invention comprises a cantilever bracket structure 43 to hold the inner decking 38 in place.

20 The bracket structure fits around the bottom of the glass balustrade panel 20, thus also serving to hold the panel in place and is, on the outer side of the panel, fixedly attached to the frame or truss 10 by means of bolts 44. The bracket further comprises a frame structure 45 which extends out to the inner decking 38
25 and to which the inner decking is fixed again, e. g., by means of bolts 46. The frame structure can also be shaped to extend to both the top bottom and intermediate parts of the inner decking panel for attachment at various points, particularly at both ends.

30

 The dimensions of the bracket structure are such that the structure and the inner decking panel 38 overlap the moving skirt panels 42 at the edges of the steps 12.

35

 Thus, the gap between the step and the inner decking is very small. The bracket structure 43 itself

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is a monocoque construction. It is possible to fit different shaped inner decking panels, e. g. straight or curved, to this holder.

5 Figure 5 shows the fastening arrangement of the present invention in cross-section in relationship to other of the major escalator components, namely a truss 10, a balustrade panel 20, inner and outer decking profiles 38, 36 and the moveable skirt 42. In this description, 'inward' means towards the step, 'outward' means away from the step; 'upward' means toward the top of the escalator and 'downwards' means towards the bottom of the escalator.

15 The balustrade panel 20 is preferably a sheet of glass having a horizontal thickness and extending vertically-by-longitudinally. The fastening arrangement includes a glassholder 47 with a U-shaped cross section defining a channel 48 into which the balustrade panel 20 fits. The balustrade panel is then clamped in place by a clamp arrangement extending from the U-shaped holder. The holder is bolted to components of the escalator truss.

25 The holder further comprises a bracket or frame structure 45 which extends along the bottom part of the U-shape and then comprises arms 49 extending upwardly and outwardly, outwardly and downwardly and outwardly towards the inner decking profile 38. This arm arrangement is fixedly attached to the U-shaped holder 30 47 by means of a bolt to provide a cantilevered bracket 43. The bracket then has an outer frame structure defining an upper horizontal arm and a vertical downwardly extending arm joined by an inclined or knee portion. The dimensions of the various components of 35 the bracket are such that it extends out towards the inner decking profile 38 to support the profile in a

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position overlapping the moveable skirt 42.

Thus, an inner decking can be provided in combination with a moving skirt panel such that the inner decking overhangs the skirt panel and acts to cover up the moving parts to prevent objects being caught in the escalator, whilst ensuring that the inner panel is securely held in place relative to the balustrade assembly.

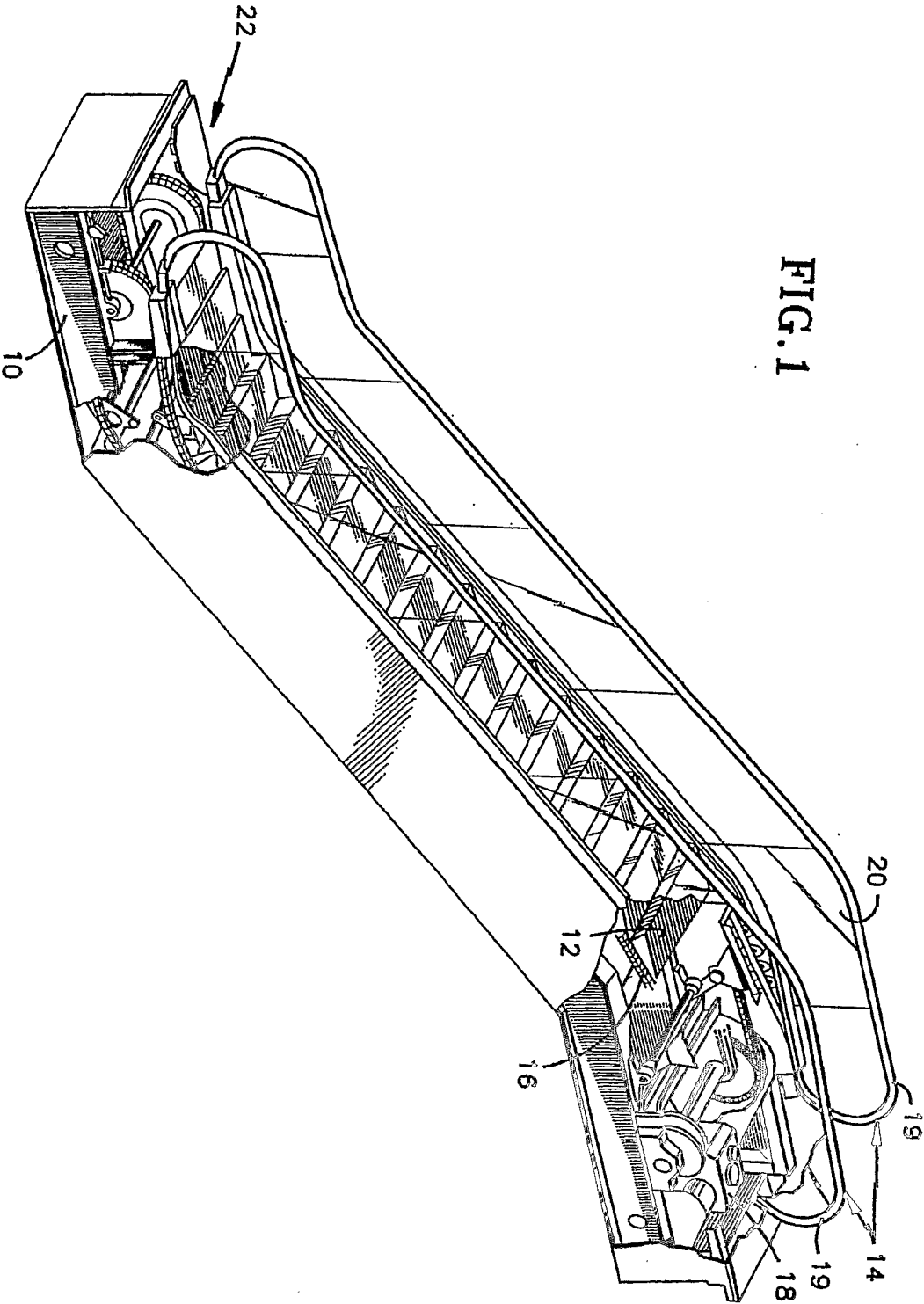
- 11 -

CLAIMS:

1. A balustrade fastening arrangement comprising means for supporting a balustrade panel, said means for
5 supporting being attachable to the frame of an escalator or passenger conveyor, said means for supporting further comprising a bracket extending therefrom adapted to be fixedly attached to an inner decking profile extending from the balustrade panel.
- 10 2. A balustrade fastening arrangement as claimed in claim 1, comprising a glassholder for holding a balustrade panel and arms attached to and extending from said balustrade holder adapted to fasten to an inner
15 decking profile at one or more points distal from the balustrade panel.
- 20 3. A balustrade assembly for an escalator or passenger conveyor, the assembly comprising a balustrade panel, a balustrade holder attaching the balustrade, in use, to a frame of the escalator or passenger conveyor, an inner decking profile extending inwardly and downwardly from the balustrade, and an outer decking profile extending outwardly from the balustrade, characterised in that the
25 balustrade holder is formed with means to receive the base portion of the balustrade and means for securing the balustrade thereto; and further comprising a bracket attached at one end to the balustrade holder and extending to be fixedly attached to the inner decking
30 profile at at least one point downwards of the balustrade.
- 35 4. An escalator or passenger conveyor comprising a truss, a balustrade, a step disposed inward of the balustrade, a balustrade holder attaching the balustrade to the truss, an inner decking profile extending inwardly and downwardly from the balustrade towards the

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step, an outer decking profile extending outwardly from the balustrade, a skirt located outwardly out of the step and arranged for movement therewith, and a balustrade fastening means comprising a bracket for
5 attachment to said truss and attachment to said inner decking profile, said bracket being configured such that said inner decking profile, when attached to said bracket, overlaps said skirt between said skirt and said step.



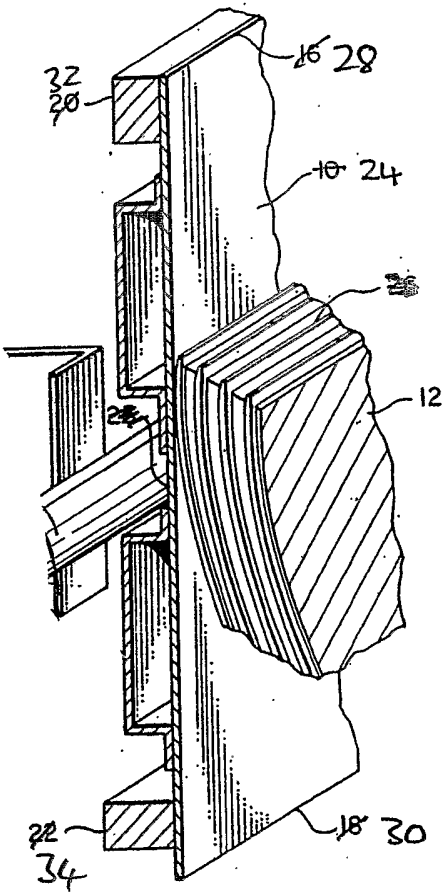


Fig. 2

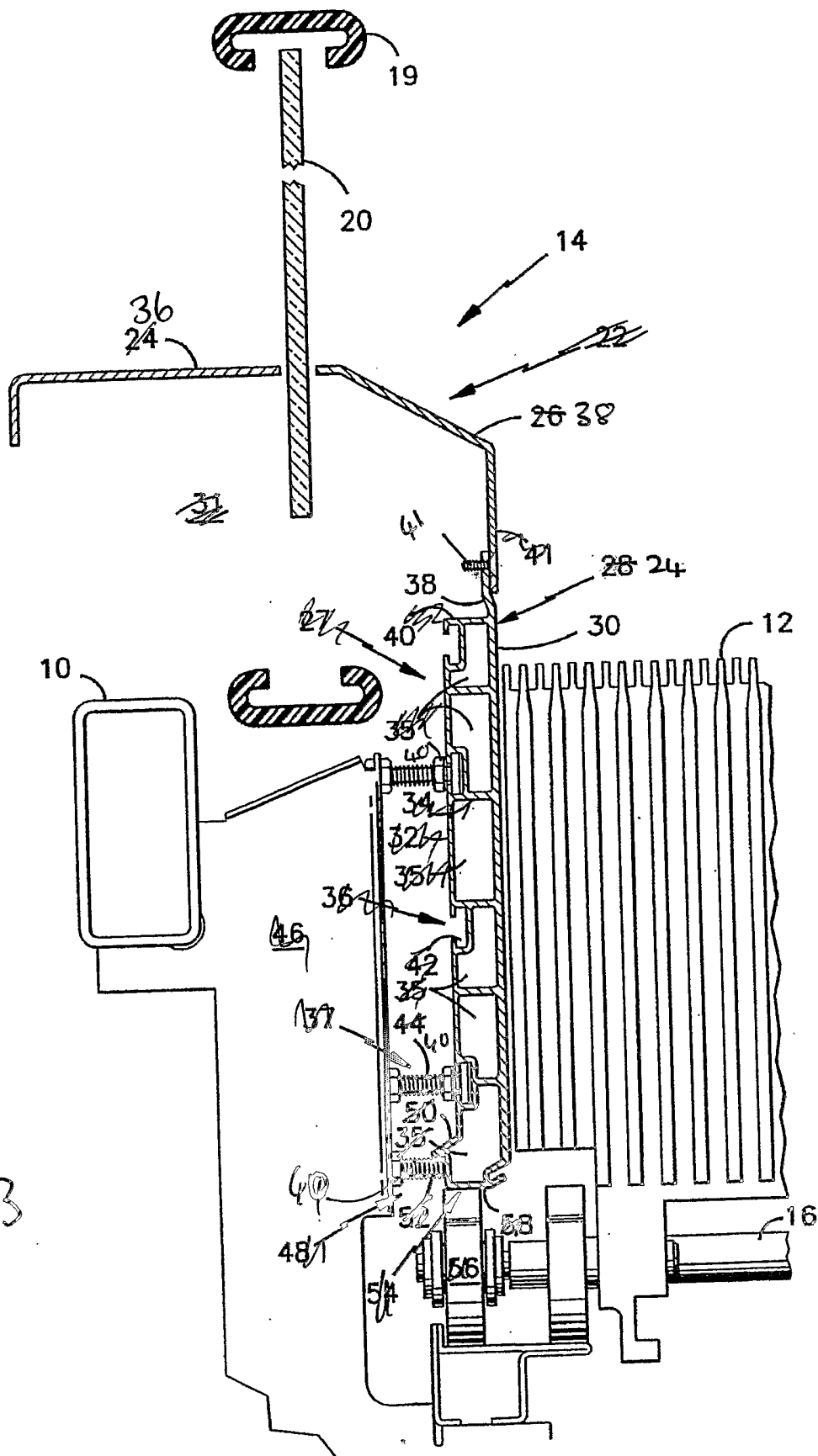


FIG. 3

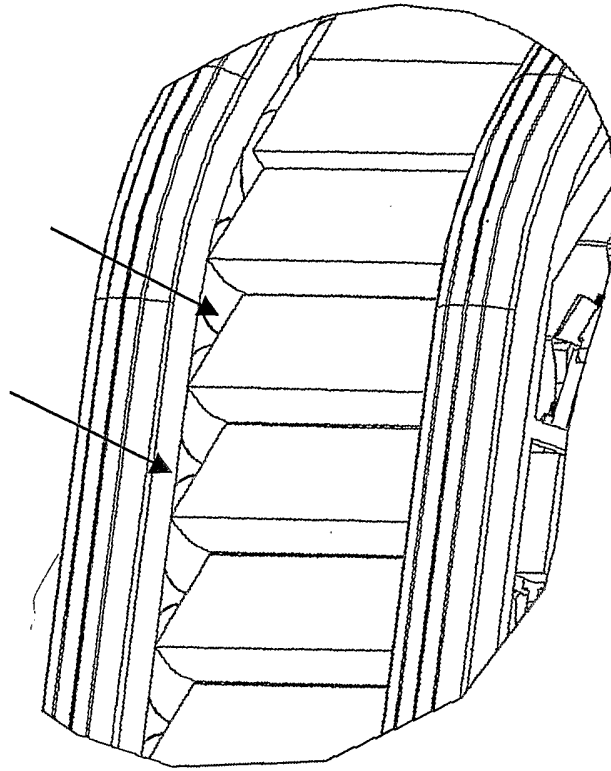


FIG. 4

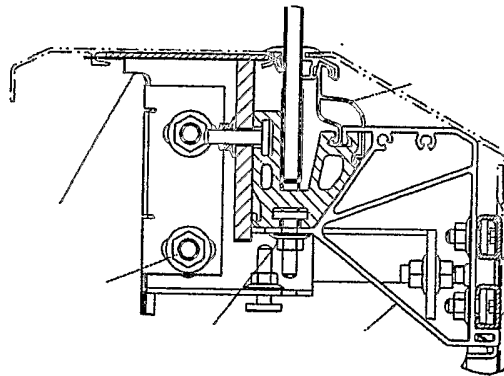


FIG. 5

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/01257

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B66B23/22 B66B23/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B66B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 186 302 A (JOHNSON GERALD E ET AL) 16 February 1993 (1993-02-16) column 3, line 42 - column 4, line 26	1-3
X	PATENT ABSTRACTS OF JAPAN vol. 1996, no. 04, 30 April 1996 (1996-04-30) & JP 07 315747 A (TOSHIBA CORP), 5 December 1995 (1995-12-05) abstract; figure 4	1-3

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"&" document member of the same patent family

Date of the actual completion of the international search

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13.02.2004

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP 03/01257

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-3

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-3

Assembly comprising fastening means for supporting a balustrade panel and a bracket extending therefrom to be fixedly attached to the inner decking profile.

2. claim: 4

Assembly comprising means for fastening a balustrade, said means comprising a bracket for attachment to the inner decking profile, said means being configured such that said inner decking profile overlaps the movable skirt arranged on the steps.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 03/01257

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5186302	A	16-02-1993	NONE	

JP 07315747	A	05-12-1995	NONE	
