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

(11) EP 1 468 953 A1

(12) EUROPEAN PATENT APPLICATION
published in accordance with Art. 158(3) EPC

(43) Date of publication:
20.10.2004 Bulletin 2004/43

(21) Application number: **02790780.7**

(22) Date of filing: **16.12.2002**

(51) Int Cl.[7]: **B66B 21/02**, B66B 23/14

(86) International application number:
PCT/JP2002/013130

(87) International publication number:
WO 2003/062122 (31.07.2003 Gazette 2003/31)

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

(30) Priority: **22.01.2002 JP 2002013338**

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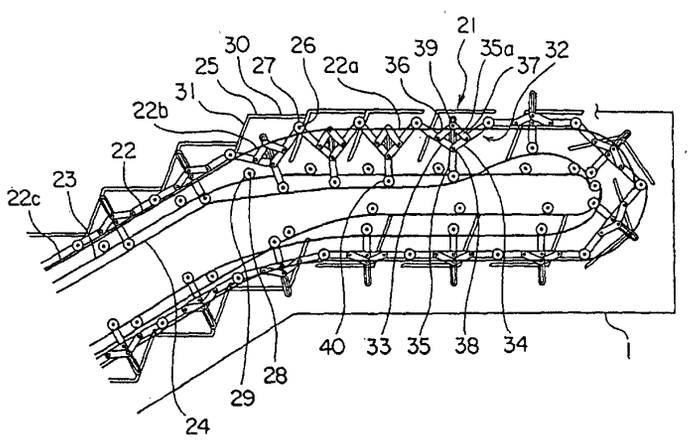
(54) SLOPED PART HIGH-SPEED ESCALATOR

(57) In a high-speed inclined portion escalator, a step has a step main body; a step link roller shaft, a step link roller, a trailing roller shaft, and a trailing roller. The step main body has a tread and a riser. The trailing roller is disposed in a region of overlap between a region below a straight line parallel to an intermediate inclined portion of a cyclic path contacting a lower edge portion of the riser and a region below a horizontal straight line contacting the lower edge portion of the riser when the step is viewed from a side direction with the tread on top in a horizontal state.

FIG. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a high-speed inclined portion escalator in which a traveling speed of steps in an intermediate inclined portion is faster than a traveling speed of the steps in an upper landing portion and a lower landing portion.

BACKGROUND ART

[0002] Figure 7 is a cross section of a conventional high-speed inclined portion escalator such as that disclosed in Japanese Patent Laid-Open No. SHO 51-116586 (Gazette), for example, and Figure 8 is a side elevation showing a vicinity of an upper inversion portion of the high-speed inclined portion escalator in Figure 7. In the figures, a plurality of steps 2 linked endlessly are disposed on a main frame 1. The steps 2 have: a step main body 3; a step link roller shaft 4 extending in a width direction of the step main body 3; a pair of step link rollers 5 that are rotatable around the step link roller shaft 4; a trailing roller shaft 6 extending in a width direction of the step main body 3; and a pair of trailing rollers 7 that are rotatable around the trailing roller shaft 6. The step main body 3 includes: a tread 8; and a riser 9 disposed on an edge portion of the tread 8.

[0003] The steps 2 are driven by a drive unit 10, and are moved cyclically. A pair of main tracks 11 forming a cyclic path for the steps 2 and guiding the step link rollers 5, a pair of trailing tracks 12 for controlling an attitude of the steps 2, and a pair of auxiliary tracks 13 for changing a pitch between adjacent steps 2 are disposed on the main frame 1. The step link roller shafts 4 of mutually-adjacent steps 2 are linked to each other by a pair of linking mechanisms 14. An auxiliary roller 15 rolling so as to be guided by an auxiliary track 13 is disposed on each of the linking mechanisms 14.

[0004] In a conventional high-speed inclined portion escalator of this kind, a pitch between the step link roller shafts 4 of adjacent steps 2, and thus a relative pitch between the adjacent steps 2, is changed by the auxiliary rollers 15 being guided by the auxiliary tracks 13 to change the shape of the linking mechanisms 14 so as to fold and unfold. Thus, a traveling speed of the steps 2 is changed depending on position in the cyclic path. Specifically, in an upper landing portion and a lower landing portion, the pitch between the step link roller shafts 4 of the adjacent steps 2 is minimized and the steps 2 move at low speed. In an intermediate inclined portion, the pitch between the step link roller shafts 4 is maximized, and the steps 2 move at high speed.

[0005] However, in a conventional high-speed inclined portion escalator constructed as described above, the trailing rollers 7 are disposed in a region inside a width of the step main body 3 and above a lower edge portion of the riser 9. Because of this, the riser 9 contacts the trailing tracks 12 from an inversion portion to the return inclined portion of the cyclic path of the steps 2. One method for avoiding contact of this kind is to dispose notch portions on the riser 9 to avoid the trailing tracks 12, but in that case, a means is required for preventing the notch portions from being exposed in the forward intermediate inclined portion, making the construction complicated.

DISCLOSURE OF THE INVENTION

[0006] The present invention aims to solve the above problems and an object of the present invention is to provide a high-speed inclined portion escalator enabling contact between a trailing track and a riser to be prevented by a simple construction.

[0007] In order to achieve the above object, according to one aspect of the present invention, there is provided a high-speed inclined portion escalator comprising: a main frame; a plurality of steps having a step main body including a tread and a riser disposed on an edge portion of the tread, a step link roller shaft extending in a width direction of the step main body, a step link roller rotatable around the step link roller shaft, a trailing roller shaft extending in a width direction of the step main body, and a trailing roller rotatable around the trailing roller shaft, the plurality of steps being linked endlessly and being moved cyclically; a main track disposed on the main frame, the main track forming a cyclic path including an intermediate inclined portion and guiding the step link roller; a trailing track disposed on the main frame, the trailing track guiding the trailing roller and controlling an attitude of the steps; a plurality of linking mechanisms for linking the step link roller shafts of mutually-adjacent pairs of the steps and changing a pitch between the step link roller shafts by changing shape; an auxiliary roller disposed on each of the linking mechanisms; and an auxiliary track disposed on the main frame, the auxiliary track changing a traveling speed of the steps depending on position by guiding the auxiliary rollers to change the shape of the linking mechanisms, wherein the trailing roller is disposed in a region of overlap between a region below a straight line parallel to the intermediate inclined portion contacting a lower edge portion of the riser and a region below a horizontal straight line contacting the lower edge portion of the riser when the step is viewed from a side direction with the tread on top in a horizontal state.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Figure 1 is a side elevation showing a vicinity of an upper inversion portion of a high-speed inclined portion escalator according to Embodiment 1 of the present invention;

Figure 2 is a front elevation showing a step from

Figure 1;
Figure 3 is an explanatory diagram showing a position of a trailing roller relative to a step main body from Figure 1;
Figure 4 is an explanatory diagram showing a positional relationship between a trailing track and a riser when the step in Figure 3 has moved to an intermediate inclined portion of a return section;
Figure 5 is an explanatory diagram showing a positional relationship between the trailing track and the riser when the step in Figure 3 has moved to a horizontal portion of the return section;
Figure 6 is a side elevation showing a vicinity of an upper inversion portion of a high-speed inclined portion escalator according to Embodiment 2 of the present invention;
Figure 7 is a cross section of a conventional high-speed inclined portion escalator; and
Figure 8 is a side elevation showing a vicinity of an upper inversion portion of the high-speed inclined portion escalator in Figure 7.

BEST MODE FOR CARRYING OUT THE INVENTION

[0009] Preferred embodiments of the present invention will now be explained with reference to the drawings.

Embodiment 1

[0010] Figure 1 is a side elevation showing a vicinity of an upper inversion portion of a high-speed inclined portion escalator according to Embodiment 1 of the present invention. In the figure, a plurality of steps 21 linked endlessly are disposed on a main frame 1. A pair of main tracks (step link roller tracks) 22 forming a cyclic path for the steps 21, a pair of trailing tracks (trailing roller tracks) 23 for controlling the attitude of the steps 21, and a pair of auxiliary tracks (auxiliary roller tracks) 24 for changing a pitch between adjacent steps 21 are disposed on the main frame 1.

[0011] The cyclic path for the steps 21 has: a forward section, a return section, an upper inversion portion, and a lower inversion portion. The forward section of the cyclic path has: an upper landing portion (an upper horizontal portion) 22a, an upper curved portion 22b, an intermediate inclined portion (a constant inclination portion) 22c, a lower curved portion, and a lower landing portion (a lower horizontal portion).

[0012] The steps 21 have: a step main body 25; a step link roller shaft 26 extending in a width direction of the step main body 25; a pair of step link rollers 27 that are rotatable around the step link roller shaft 26; a trailing roller shaft 28 extending in a width direction of the step main body 25; and a pair of trailing rollers 29 that are rotatable around the trailing roller shaft 28. The step main body 25 has: a tread 30 for carrying passengers; and a riser 31 disposed upright on an edge portion on a downstairs side of the tread 30. The riser 31 has a shape that protrudes outward on the downstairs side in the intermediate inclined portion. The step link rollers 27 roll along the main tracks 22. The trailing rollers 29 roll along the trailing tracks 23.

[0013] The step link roller shafts 26 of mutually-adjacent steps 21 are linked to each other by a pair of linking mechanisms (folding links) 32 at both ends of the step main body 25. Each of the linking mechanisms 32 has first to fifth links 33 to 37.

[0014] A first end portion of the first link 33 is linked pivotably to the step link roller shaft 26. A second end portion of the first link 33 is linked pivotably to an intermediate portion of the third link 35 by means of a shaft 38. A first end portion of the second link 34 is linked pivotably to the step link roller shaft 26 of the adjacent step 21. A second end portion of the second link 34 is linked pivotably by means of the shaft 38 to the intermediate portion of the third link 35.

[0015] A first end portion of the fourth link 36 is connected pivotably to an intermediate portion of the first link 33. A first end portion of the fifth link 37 is connected pivotably to an intermediate portion of the second link 34. Second end portions of the fourth and fifth links 36 and 37 are linked to a first end portion of the third link 35 by means of a sliding shaft 39.

[0016] A guiding groove 35a for guiding sliding of the sliding shaft 39 in the longitudinal direction of the third link 35 is disposed on the first end portion of the third link 35. A rotatable auxiliary roller 40 is disposed on a second end portion of the third link 35. The auxiliary roller 40 is guided by the auxiliary tracks 24.

[0017] A pitch between the step link roller shafts 26 of adjacent steps 21, and thus a relative pitch between the adjacent steps 21, is changed by the auxiliary rollers 40 being guided by the auxiliary tracks 24 to change the shape of the linking mechanisms 32 so as to fold and unfold. Conversely, tracks of the auxiliary tracks 24 are designed such that the relative pitch between adjacent steps 21 changes.

[0018] Next, Figure 2 is a front elevation showing a step 21 from Figure 1. Both end portions of the step link roller shaft 26 project outward from both end portions of the step main body 25 in a width direction. The step link rollers 27 are mounted in a vicinity of both end portions of the step link roller shaft 26. The linking mechanisms 32 are coupled to the step link roller shaft 26 between the step main body 25 and the step link rollers 27. The trailing rollers 29 are disposed within a range of a width of the step main body 25 when the step 21 is viewed from a front direction.

[0019] Figure 3 is an explanatory diagram showing a position of a trailing roller 29 relative to a step main body 25 from Figure 1. The trailing roller 29 is disposed in a region of overlap (a region indicated by oblique lines in Figure 3) between a region below (i.e., on an opposite side from the step main body 25 relative to) a straight line L1 parallel to the intermediate inclined portion 22c

contacting a lower edge portion of the riser 31 and a region below (i.e., on an opposite side from the step main body 25 relative to) a horizontal straight line L2 contacting the lower edge portion of the riser 31 when the step 21 is viewed from a side direction with the tread 30 on top in a horizontal state. In addition, the trailing roller 29 is disposed in a region on a side of a straight line L3 joining an upper edge portion and the lower edge portion of the riser 31 that is nearer to the step link roller shaft 26 .

[0020] Next, operation will be explained. The speed of the steps 21 is changed by changing the pitch between the step link roller shafts 26 of adjacent steps 21. Specifically, in the upper landing portion 22a and the lower landing portion where the passengers get on and off, the pitch between the step link roller shafts 26 of adjacent steps 21 is minimized, and the steps 21 move at low speed. In the intermediate inclined portion 22c, the pitch between the step link roller shafts 26 of adjacent steps 21 is maximized, and the steps 21 move at high speed. In addition, in the upper curved portion 22b and the lower curved portion, the pitch between the step link roller shafts 26 is changed, and the steps 21 accelerate or decelerate.

[0021] The first, second, fourth, and fifth links 33, 34, 36, and 37 constitute a four-link "pantograph" linking mechanism, enabling the angle formed by the first and second links 33 and 34 to be enlarged and reduced with the third link 35 as an axis of symmetry. Thus, the pitch between the step link roller shafts 26 of the adjacent steps 21 linked by the first and second links 33 and 34 can be changed.

[0022] In the landing portions in Figure 1, the pitch between the step link roller shafts 26 of adjacent steps 21 is minimized. From this state, when the distance between the main tracks 22 and the auxiliary tracks 24 is reduced, the linking mechanisms 32 operate in a similar manner to the operation of the frame of an umbrella as the umbrella is being opened out, increasing the pitch between the step link roller shafts 26 of the adjacent steps 21.

[0023] The distance between the main tracks 22 and the auxiliary tracks 24 is smallest in the intermediate inclined portion 22c in Figure 1, and the pitch between the step link roller shafts 26 of the adjacent steps 21 is maximized. Consequently, the speed of the steps 21 is maximized in this region. In this state, the first and second links 33 and 34 are disposed almost in a straight line.

[0024] In a high-speed inclined portion escalator such as described above, because the trailing rollers 29 are disposed in the region of overlap between the region below the straight line L1 and the region below the straight line L2 in Figure 3, contact between the trailing track 23 and the riser 31 can be prevented by a simple construction without disposing notch portions on the riser 31.

[0025] Figure 4 is an explanatory diagram showing a positional relationship between the trailing track 23 and the riser 31 when the step 21 in Figure 3 has moved to an intermediate inclined portion of the return section. Specifically, Figure 4 shows the step 21 in Figure 3 in an inverted state. Consequently, in Figure 4, the trailing roller 29 is disposed in a region above the straight line L1. Accompanying this, the trailing track 23 for guiding the trailing rollers 29 is disposed above the step 21 at a gradient equivalent to a gradient of the intermediate inclined portion. Because of this, contact between the trailing track 23 and the riser 31 is also prevented in the intermediate inclined portion of the return section.

[0026] Figure 5 is an explanatory diagram showing a positional relationship between the trailing track 23 and the riser 31 when the step 21 in Figure 3 has moved to a horizontal portion of the return section. In this state, the trailing roller 29 is disposed in a region above the straight line L2. Accompanying this, the trailing track 23 for guiding the trailing rollers 29 is disposed horizontally above the step 21. Because of this, contact between the trailing track 23 and the riser 31 is also prevented in the horizontal portion of the return section.

[0027] Contact between the trailing track 23 and the riser 31 is also prevented in other portions of the cyclic path. In other words, contact between the trailing track 23 and the riser 31 can be prevented in the whole of the cyclic path.

[0028] In addition, because the trailing rollers 29 are disposed within a range of a width of the step main body 25 when the step 21 is viewed from a front direction, the overall width dimensions of the escalator can be prevented from being enlarged.

[0029] Furthermore, because the trailing roller 29 is disposed in a region on a side of a straight line L3 joining an upper edge portion and the lower edge portion of the riser 31 that is nearer to the step link roller shaft 26 when the step 21 is viewed from a side direction with the tread 30 on top in a horizontal state, the distance between the step link roller shaft 26 and the trailing roller shaft 28 is reduced, enabling a radius of gyration to be reduced during the inversion of the steps 21, thereby enabling an overall reduction in size.

Embodiment 2

[0030] Next, Figure 6 is a side elevation showing a vicinity of an upper inversion portion of a high-speed inclined portion escalator according to Embodiment 2 of the present invention. In the figure, step link roller shafts 26 of adjacent steps 21 are linked to each other by a pair of linking mechanisms (folding linking mechanisms) 41 at both ends of a step main body 25. The linking mechanisms 41 in Embodiment 2 have an even simpler construction than the linking mechanisms 32 according to Embodiment 1.

[0031] Each of the linking mechanisms 41 has: a first link 42 having a bend in an intermediate portion; and a second link 43 having a linear shape. A first end portion of the first link 42 is linked to a step link roller shaft 26. An auxiliary roller 40 is mounted to a second end portion

of the first link 42. A first end portion of the second link 43 is linked to the step link roller shaft 26 of an adjacent step 21. A second end portion of the second link 43 is linked by means of a shaft 44 to an intermediate portion of the first link 42. The rest of the construction is similar to that of Embodiment 1.

[0032] When linking mechanisms 41 of this kind are used, contact between the trailing track 23 and the riser 31 can also be prevented by a simple construction if the trailing rollers 13 is disposed in a region similar to that of Embodiment 1.

[0033] Moreover, in Embodiments 1 and 2, flat risers 31 are shown, but risers having a shape including a curved surface may also be used.

[0034] Furthermore, the construction of the linking mechanisms is not limited to those of Embodiments 1 and 2.

[0035] In addition, in Embodiments 1 and 2, the trailing roller 29 is disposed in a region on a side of a straight line L3 joining an upper edge portion and the lower edge portion of the riser 31 that is nearer to the step link roller shaft 26, but it can also be disposed on an opposite side of the straight line L3 from the step link roller shaft 26.

Claims

1. A high-speed inclined portion escalator comprising:

a main frame;
a plurality of steps having a step main body including a tread and a riser disposed on an edge portion of the tread, a step link roller shaft extending in a width direction of the step main body, a step link roller rotatable around the step link roller shaft, a trailing roller shaft extending in a width direction of the step main body, and a trailing roller rotatable around the trailing roller shaft, the plurality of steps being linked endlessly and being moved cyclically;
a main track disposed on the main frame, the main track forming a cyclic path including an intermediate inclined portion and guiding the step link roller;
a trailing track disposed on the main frame, the trailing track guiding the trailing roller and controlling an attitude of the steps;
a plurality of linking mechanisms for linking the step link roller shafts of mutually-adjacent pairs of the steps and changing a pitch between the step link roller shafts by changing shape;
an auxiliary roller disposed on each of the linking mechanisms; and
an auxiliary track disposed on the main frame, the auxiliary track changing a traveling speed of the steps depending on position by guiding the auxiliary rollers to change the shape of the linking mechanisms,

wherein the trailing roller is disposed in a region of overlap between a region below a straight line parallel to the intermediate inclined portion contacting a lower edge portion of the riser and a region below a horizontal straight line contacting the lower edge portion of the riser when the step is viewed from a side direction with the tread on top in a horizontal state.

2. The high-speed inclined portion escalator according to Claim 1, wherein the trailing rollers are disposed within a range of a width of the step main body when the step is viewed from a front direction.

3. The high-speed inclined portion escalator according to Claim 1, wherein the trailing roller is disposed in a region on a side of a straight line joining an upper edge portion and a lower edge portion of the riser that is nearer to the step link roller shaft when the step is viewed from a side direction with the tread on top in a horizontal state.

FIG. 1

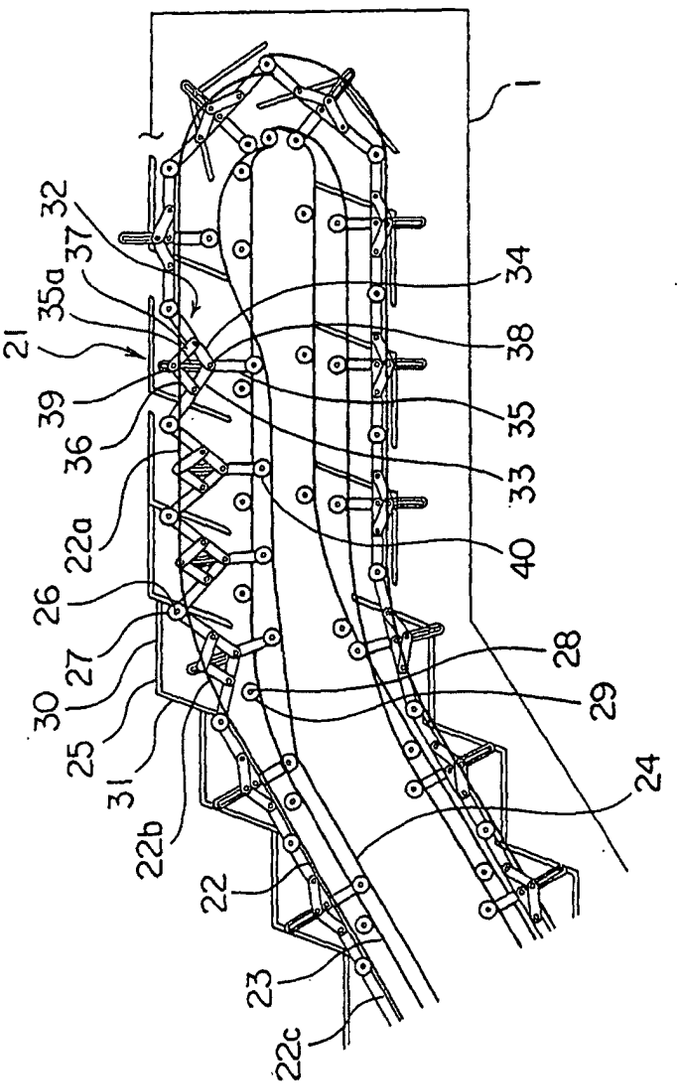
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FIG. 2

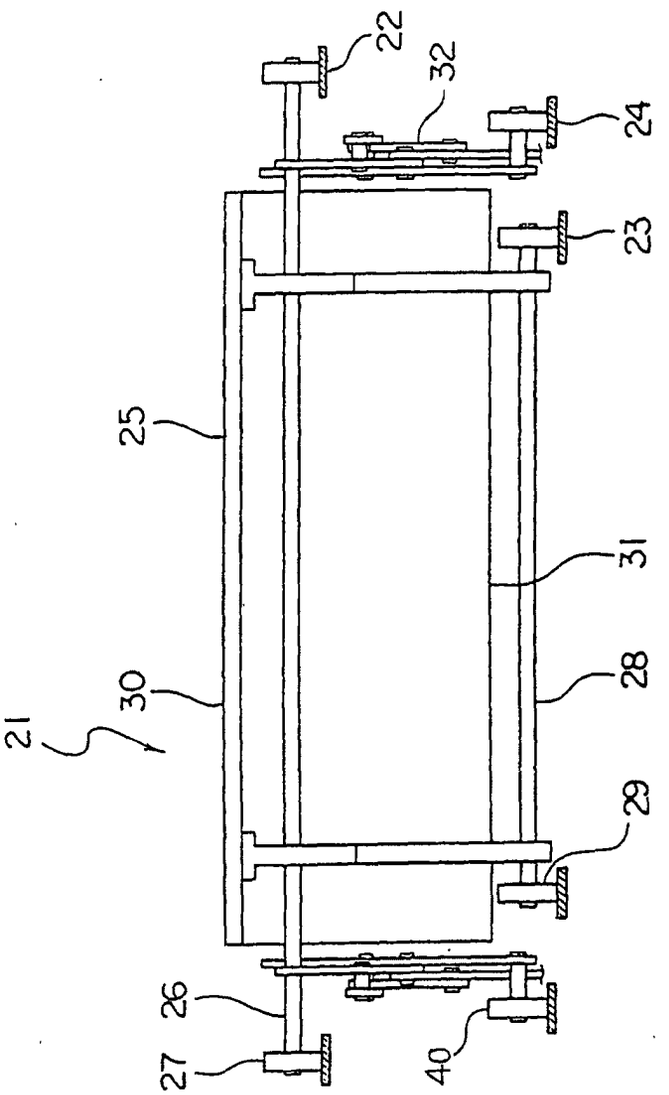


FIG. 3

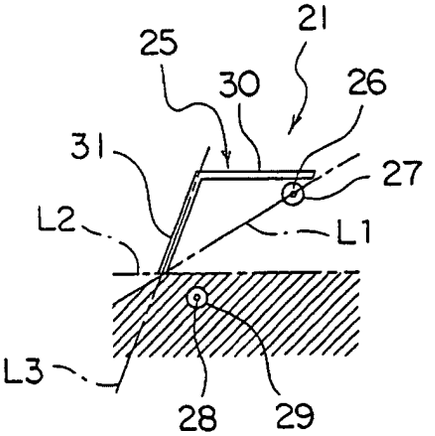


FIG. 4

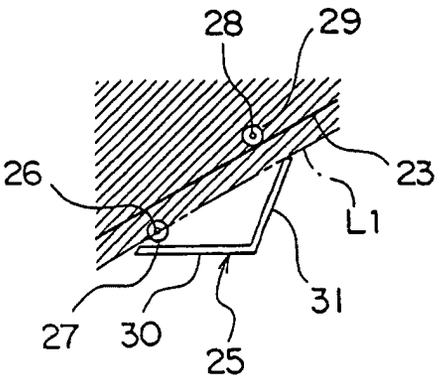


FIG. 5

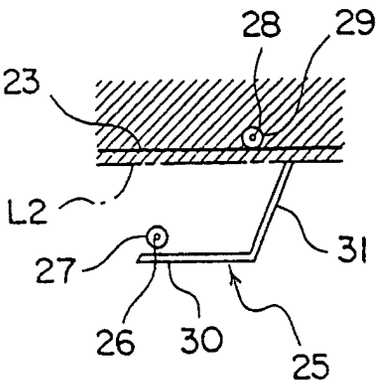


FIG. 6

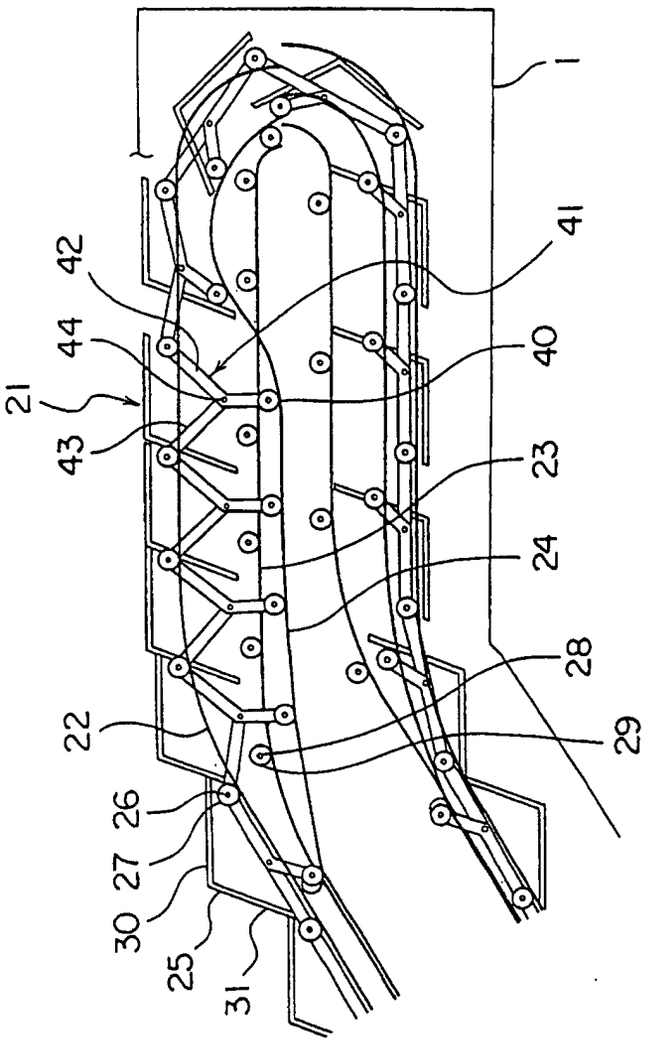


FIG. 7

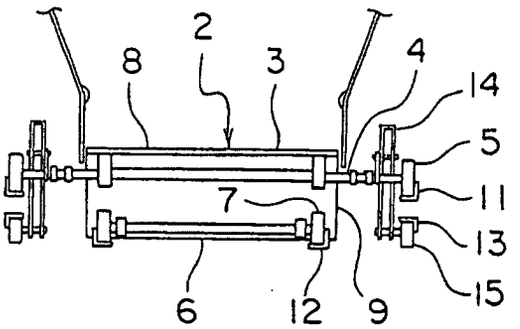
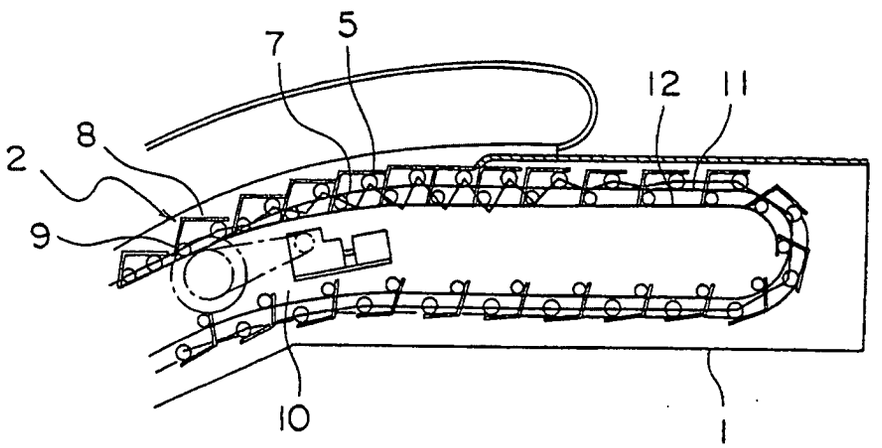


FIG. 8



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP02/13130

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] B66B21/02, B66B23/14

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)
Int.Cl[7] B66B21/00-B66B31/02

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

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2003
Kokai Jitsuyo Shinan Koho	1971-2003	Toroku Jitsuyo Shinan Koho	1994-2003

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E,X	JP 2003-2572 A (Mitsubishi Electric Corp.), 08 January, 2003 (08.01.03), (Family: none)	1,3
P,X	JP 2002-326780 A (Mitsubishi Electric Corp.), 12 November, 2002 (12.11.02), (Family: none)	1,3
A	JP 51-116586 A (Hitachi, Ltd.), 14 October, 1976 (14.10.76), (Family: none)	1-3

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
01 April, 2003 (01.04.03)	15 April, 2003 (15.04.03)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
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