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(54) **Re-cycling handrail.**

(57) A dual path moving walkway or pair of escalators or walkways is provided with two re-cycling handrail belts. (20,21). The handrail (20) on the outer balustrade of one path or escalator crosses between the pair of paths or escalators and on to the outer balustrade of the other by guides (D.I) which impart a twist to the belt and allows it to bend about its transverse axis. The inner belt (21) passes from one inner balustrade to the other *via* a horizontal pulley.

Removable panels in the balustrades permit removal of the handrail belts from their guides and then removal from the balustrades.

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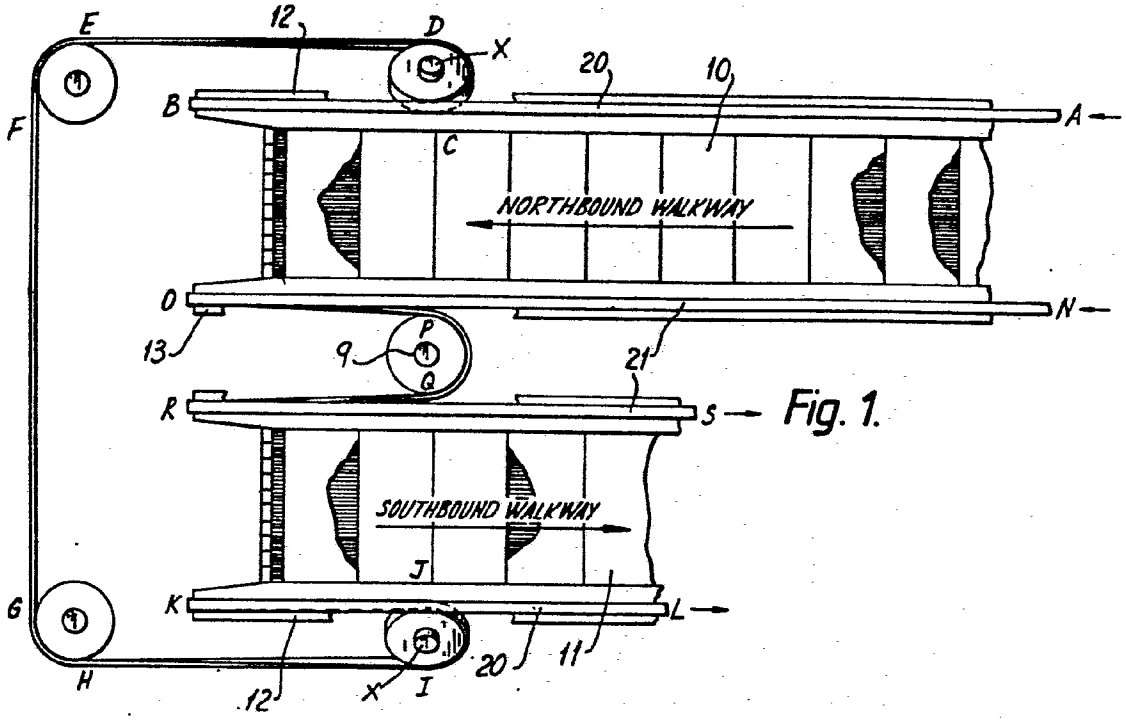
E
12
D
X
20
10
F
B
A
C
NORTHBOUND WALKWAY
O
N
13
9
P
Q
21
R
S
SOUTHBOUND WALKWAY
J
G
K
L
20
11
H
12
X
I

Fig. 1.

This invention relates to dual path moving walkways and pairs of escalators or walkways, and more especially to the handrails thereof.

Normally, each walkway or escalator has two handrails each including an endless belt slidably carried on a guide rail. Only the upper run of each belt serves a useful purpose and the lower or return run is concealed. The cost and the amount of the belt material is, of course, considerable requiring four belts, each of which is more than twice the length of the walkway or escalator.

Moving walkways have tended to range in length from 30 - 100 metres. Recent developments indicate that higher cruising speeds and other considerations will result in walkways many times that length being used.

It is clear that re-cycling handrails for these long walkways would result in substantial saving as would re-cycling handrails for pairs of escalators. At the present time a pair of walkways or escalators 100 metres long would utilise four loops of handrail of slightly more than 200 metres, i.e. perhaps 820 metres in all.

It is an object of the present invention to obviate or mitigate the aforementioned disadvantages.

The present invention is a dual pathway walkways or pair of escalators operating in opposite directions wherein each walkway or escalator has at least one movable handrail mounted on a balustrade, said two handrails being movable in opposite directions and provided by a common endless belt the major length of which provides an upper run on each balustrade, the

belt at each end of the pathway or pair of escalators crossing between the balustrades in association with guide means which impart an axial twist to the belt of substantially 90° to enable the belt to bend about its transverse axis during its passage between the balustrades.

Preferably, two handrail belts are provided, wherein one belt is monted on each outer balustrade and one belt is mounted on each inner balustrade, at least the outer belt at each end of the walkway or escalator crossing between the outer balustrade below the level of the walkway floor or escalator entry or exit area.

Preferably also, the guide means comprises a plurality of guide members adapted to alter the direction of the belt.

Preferably also, at least one tensioning device is provided for the or each belt.

Preferably also, removable panels are provided in the balustrade at locations where the or each belt bends through 180° about its transverse axis whereby the belt can be removed from its balustrades.

Thus, the handrail of the invention forms only one or two loops of handrail, an inner one which might be 230 metres long when used with an installation of 100 metres, and/or an outer loop which might be 240 metres long. It will thus be seen that in the size of installation referred to using four handrails, the conventional length of handrail belt might be 820 metres compared with about 470 metres for the two loops of re-cycling belt.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying

drawings, in which:-

Fig. 1 is a plan view of one end of a dual path walkway; and

Fig. 2 is a side elevation of one end of a walkway or escalator showing the path of a handrail belt.

Referring to Fig. 1, which shows a typical layout of a dual path moving walkway and represents a construction where there is minimal space restriction; other configurations are described hereinafter which nevertheless include the same general principles of a single inner handrail working on both walkways and/or a single outer handrail similarly employed.

In every case and in all configurations the handrail can be quickly and easily removed or replaced, as will be described hereinafter.

A dual pathway walkway comprising two side-by-side paths 10, 11 the floors of which move in opposite directions. The floors may be a continuous track serving both paths or separate tracks moving in opposite directions. Each walkway has a pair of balustrades 12, 13 and each balustrade has a handrail 20, 21 movable in association with the respective floors on a guide rail (not shown) along the top of the balustrade and curving around the ends thereof the handrail comprising a belt mounted on the guide rails and slidable thereon. The belt may be reinforced rubber of C section for engagement over the rail.

Instead of four individual endless belts, one for each balustrade and having an upper run and a lower return run, only two endless belts 20, 21 are provided one 20 being mounted on the outer balustrade of each walkway and the other 21 on the inner balustrade such that a major length of

each belt provides an upper run on each of its two balustrades. The outer belt 20 crosses between the balustrades under the floors of the walkway at each end of the dual pathway; the inner belt 21 may also cross below floor level or at any suitable level in the area between the two inner balustrades 13.

Guide means is provided below the walkway to impart a 90^{o} axial twist to the outer belt 20 for the purpose of turning the belt so that it can bend transversely during its passage between balustrades, as will now be described in the arrangement of one belt at one end of the dual pathway.

If one path 10 is regarded as north boud, and the returning path 11 as south bound it is easier to describe the layout, and for clarity, it is assumed that the point in the path of movement of the outer belt 20 is at A.

The handrail at A is guided northward in the conventional manner along the top of the balustrade, and at the termination point B thereof its direction is reversed in any one of the presently acceptable constructions.

The handrail is now southbound at a lower level on track BC, and in this embodiment it is deemed to turn to the left or outside as shown; in order to accomplish this it is twisted through 90 degrees anti-clockwise about its central axis. Next, it is guided towards D by acceptable mechanical means, and because of the spiral twist already referred to it will be turning round the axis X with the open end of the "C" configuration towards the centre of the axis.

It will thus be seen that in this and indeed in every turn in the configurations, the orientation of the handrail is such that it flexes around the guidance means in the

manner for which handrails are designed and manufactured.

In this embodiment, tensioning assemblies are provided in the area C-D, and according to the length of the installation may be duplicated or repeated at one or all of the other three corresponding turning points in the installation.

The handrail continues on its side in the area D-E until it encounters a guidance system external to the termination of the walkway or escalator system which will be located in the general area E-F.

In the configuration being described, the area E-F incorporates a series of driving and snubbing rollers which is duplicated in G-H and provides the driving medium for the outer handrail. This drive may be duplicated at the southbound end of the walkway. It can also be accomplished by any known driving method at E-F and G-H, or by a single Newel Wheel on the central area between F and G, the arc of contact being maximised by use of suitable snubbing rollers.

The outer handrail is now directed on the course I-J-K-L so that it spirals as before and finishes up traversing the top of the southbound outer balustrade in the normal manner.

The general configuration of the inner handrail and the guidance means employed will now be described, and once again it is pointed out that this embodiment described the basic configuration, although minor alterations of the guidance, tension and driving means are possible and could be essential in some constructions.

The handrail northbound on the inner balustrade proceeds from N to O, where its direction is reversed

preferably in the same manner as the outer handrail described above. It will now be inverted and continues southward towards P, spiralling about its central axis so as to present its open section towards the axis of the guidance means used to take it to Q.

The area P-Q will incorporate a drive and tension mechanism, and purely as an example of one possible mode of accomplishing the drive and tension, a large Newel Wheel 9 is shown in Fig. 1 within the area, and this wheel is driven by electro-mechanical means from its axle which will be mounted on bearings situated below the Newel Wheel pivot point.

The whole pivot point and the bearings and drive associated with it being mounted on the tension assembly, which will of course take up the slack and maintain the correct tension throughout the whole length of the inner handrail loop.

In the configuration being described, the drive but not the tension assembly is duplicated at the southern end of the walkway or escalator.

It will have been noticed that on the drive for the inner handrail loop reference was to a large Newel Wheel, but it is emphasised that the same result can be achieved by a multiplicity of small guide and drive wheels provided all wheels are supported from the framework or base below. Thus, it is possible whether a single large wheel or a number of small wheels are utilised to slacken off the tension assembly and remove the complete handrail upwards clear of the mechanism in the area P-Q.

Accomplishment of the quick and easy removal of the

whole handrails as referred to above is further facilitated in that the movement of the inner handrail between O and P and between Q and R is accomplished on the inner face of both balustrades where it can be readily detached from the guidance means, and when the guards are removed at O and R the layout is such that the complete northern section of the handrail can be lifted off the balustrades.

Thus, considering the areas B-C and J-K on the outer handrail configuration it is practical to remove the handrail upwards and outwards from whatever guide configuration or means is selected, provided the tension has been suitably loosened.

In a similar manner the terminal ends of the outer balustrades are equipped with removable panels, and if the panels on the outside of these balustrades are removed, it is possible to remove the complete section of handrail in areas B-C-D, and in I-J-K.

The outer handrail will now be disconnected from all except the conventional guidance means on the top of both outer balustrades, and can be lifted clear of area E-F-G-H whenever appropriate floor boards are removed.

As stated at the beginning of this application, other configurations based on the same principles are possible; those on the inner handrail only concerning variations in drive and tension arrangement.

The outer handrail as described in Fig. 1 involves the use of substantial extra space outside of the outer handrail and balustrade, and it has been found practical to reverse the direction of the northbound outer handrail, then take it backwards and upwards as shown in Fig. 2. This movement from B to C in Fig. 2 requires to be accompanied by a

180 degress axial to twist about the central line of the belt, after which the handrail has its direction reversed once again, and then is guided northwards towards the outer and northern turnaround area having spiralled through the appropriate axial movement to present itself with the correct orientation to the drice and tension means in the turnaround area.

While the embodiment hereinbefore described refers to dual path walkways, it will be appreciated that the handrail belts may be similarly applied to a pair of escalators or walkways located side-by-side and movable in opposite directions, and Fig. 1 could, therefore, illustrate one end portion (either top or bottom) of a pair of escalators.

Advantages of a re-cycling handrail are as follows:-

1) The configuration for the moving handrails may be utilised in all types of passenger escalators and walkways operating in pairs, in that less than four loops of moving handrails may be utilised and still comply with the regulations governing the use of handrails and balustrades when used in conjunction these types of machines;

2) the opposite moving handrail os either one of a pair of walkways may be linked together to avoid utilising that part of the moving loop which would normally be returning unused within the balustrade.

3) The amount of handrail belt is nearly half the amount which would normally be required to service two walkways with which they are

associated;

4) both the inner and outer handrail can be separately tensioned and driven independently of any drive mechanism within the balustrade;

5) both the inner and outer handrail can be readily removed from the system without any major engineering;

6) drive means are applied at two or more drive areas in order to reduce the stress and strain on the handrail configuration

CLAIMS

1. A dual pathway walkway or pair of escalators operating in opposite directions wherein each walkway or escalator has at least one handrail mounted on a balustrade and movable in association with the respective floor or steps and guide means at the end of each walkway or escalator to guide the handrail from or on to the respective balustrade, characterised in that the two handrails (20 or 21) are provided by a common endless belt (20 or 21), the belt at each end of the pathway or escalators crossing between the balustrades (12 or 13) in association with guide means (B to K or O to R) which impart an axial twist to the belt of substantially 90^{o} to enable the belt to bend about its transverse axis during its passage between the balustrades.

2. A walkway or pair of escalators as claimed in Claim 1, characterised in that two handrail belts (20, 21) are provided, wherein one belt (20) is mounted on each outer balustrade (12) and one belt (21) is mounted on each inner balustrade (13) at least the outer belt at each end of the walkway or escalator crossing between the outer balustrade below the level of the walkway floor or escalator entry or exit area (10, 11).

3. A walkway or pair of escalators as claimed in Claim I or 2, characterised in that the guide means (B to K or O to R) comprise a plurality of guide members adapted to alter the direction of the belt (20 or 21).

4. A walkway or pair of escalators as claimed in Claim 1, 2 or 3, characterised in that at least one tensioning device (9) is provided for the or each belt.

5. A walkway or pair of escalators as claimed in any one of the preceding claims, characterised in that

removable panels are provided in the balustrades (12, 13) at locations (B to D or I to K) where the or each belt (20, 21) bends through 180° about its transverse axis whereby the belt can be removed from the balustrades.

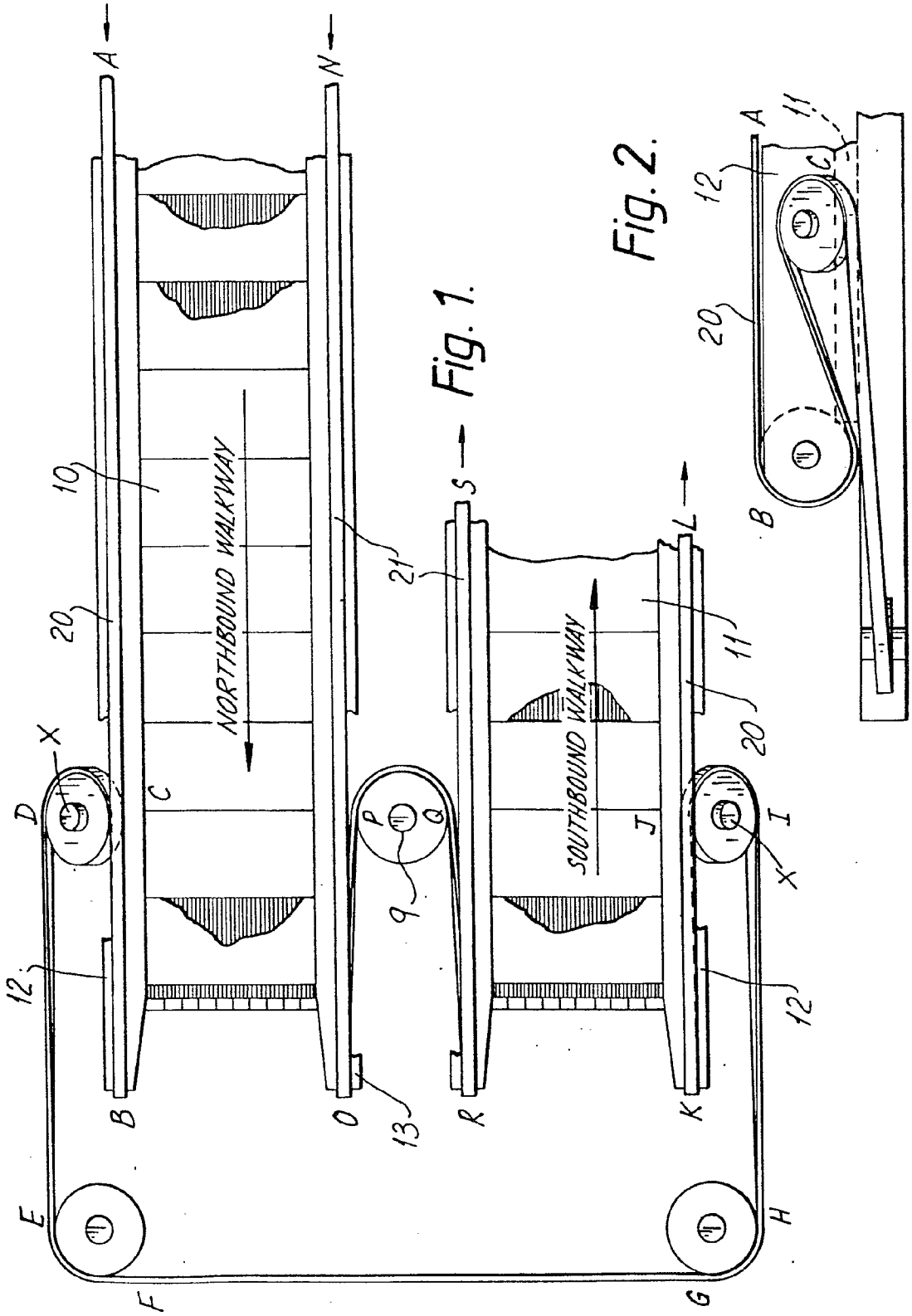
A
N
10
20
NORTHBOUND WALKWAY
X
D
C
B
12
E
F
P
Q
9
O
13
S
21
R
L
11
SOUTHBOUND WALKWAY
J
K
I
X
G
H

Fig. 1.

A
11
12
C
20
B

Fig. 2.

European Patent Office

EUROPEAN SEARCH REPORT

Application number
EP 79 30 1633

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	US - A - 3 151 726 (NELSON) * Columns 1 and 2; figures 1 to 4; claims *	1-3
	US - A - 3 048 256 (SKINNER) * Figure 1 *	1,5
	DE - A - 1 942 692 (DUNLOP) * Page 6, chapter 3; figure 3 *	4

CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)

B 66 B 9/14
B 61 B 13/14

TECHNICAL FIELDS SEARCHED (Int.Cl. ³)

B 66 B
B 61 B

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

& member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	01-10-1979	PETERS V