United States Patent

Taylor

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[54] HANDRAIL DRIVING ASSEMBLY FOR BELT TYPE MOVING PASSENGER CONVEYORS

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[52] **U.S. Cl.** .....**198/16 R**

[51] **Int. Cl.**.....**B66b 9/14**

[58] **Field of Search**.....198/16, 17; 104/25

[56] **References Cited**

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[57] **ABSTRACT**

A handrail driving assembly for belt type moving passenger conveyors in which a plurality of traction providing rollers are disposed along the length of the conveyor to operate independently of each other, each deriving its motive power from the motion of the belt.

8 Claims, 4 Drawing Figures

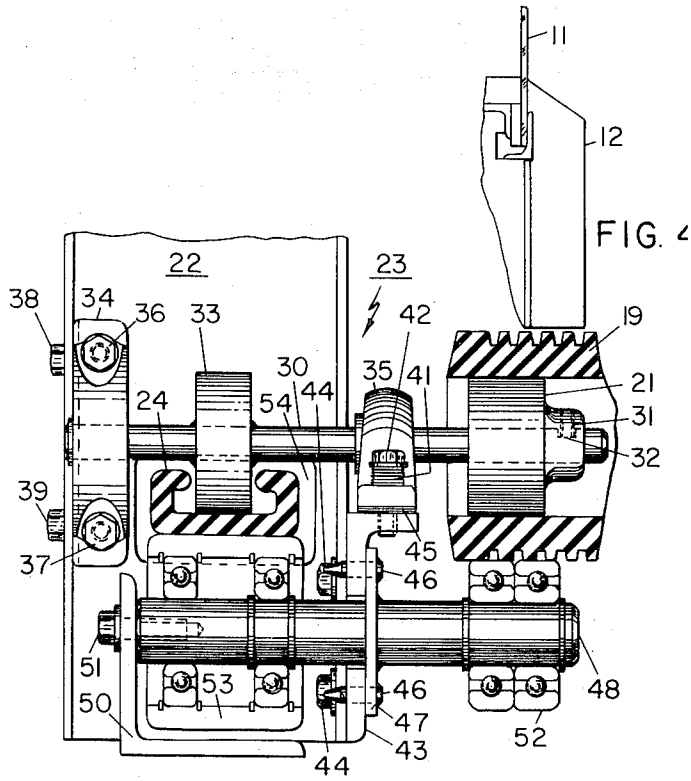

FIG. 4

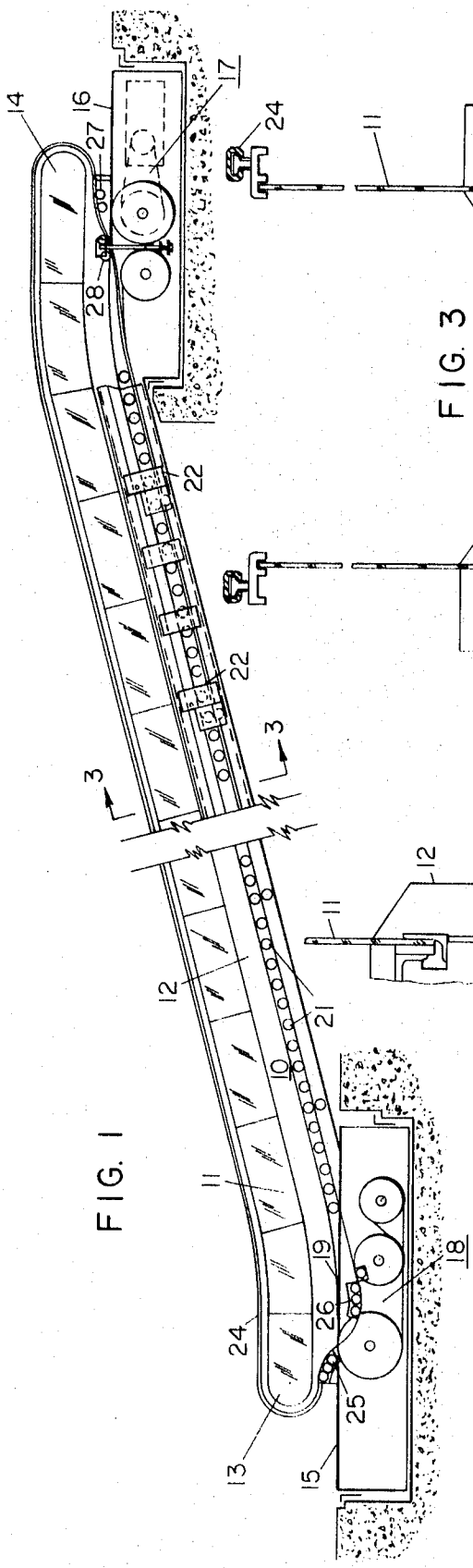

FIG. 1

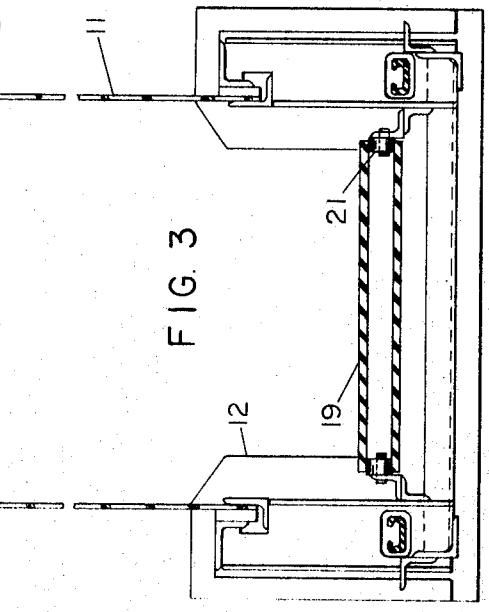

FIG. 3

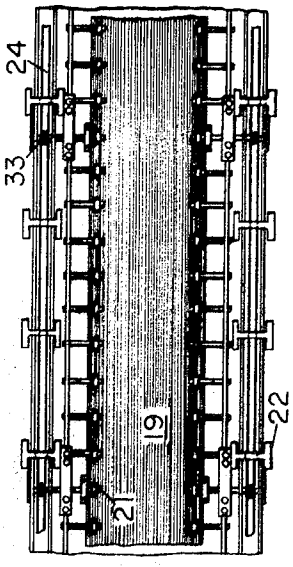

FIG. 2

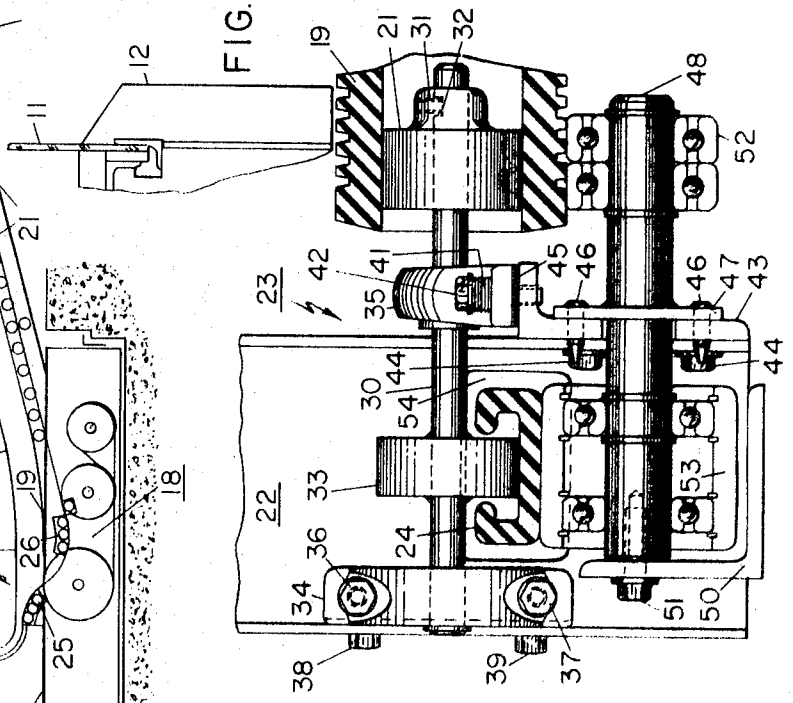

FIG. 4

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HANDRAIL DRIVING ASSEMBLY FOR BELT TYPE MOVING PASSENGER CONVEYORS

This invention relates to moving passenger conveyors in which a belt provides the riding surface for the passengers and more particularly to a handrail drive assembly for such conveyors.

In a moving sidewalk or moving stairway passenger conveyor a handrail is driven in synchronism with the passenger riding surface to assist passengers in boarding, riding on and exiting from the conveyor. Motion typically is imparted to the handrail by a traction drive sheave whose motive power is supplied through a suitable coupling by the motor which drives the endless member that forms the passenger riding surface. This drive sheave is mounted either in the newel section at the end of the conveyor balustrade or, in those conveyors in which the balustrade is transparent throughout its length, beneath the balustrade in the intervening portion of the conveyor between the landing platforms it serves. In these type arrangements it is possible, especially where the conveyor is of an extended length, that the drive assembly may provide insufficient traction to operate the handrail in the desired manner.

Another handrail drive assembly specifically for belt type conveyors proposes to urge the handrail into frictional engagement with the return run of the conveyor belt and the friction developed between the two enables the belt to pull the handrail along with it. This arrangement may overcome the insufficient traction problem that may be experienced in exceedingly long conveyors by the former more conventional arrangement but it requires that the handrail be twisted to enable it to be guided into the return run of the belt. This twisting is detrimental to handrail life and requires that the handrail be replaced more frequently than it would be in the conventional arrangement.

Still another handrail drive assembly proposes to drive the handrail of a passenger conveyor with a plurality of traction rollers mounted beneath the transparent portion of the conveyor balustrade. These rollers are all driven by a common drive chain connected between individual roller sprocket wheel that drives the member which forms the passenger riding surface. With this arrangement a break in the roller drive chain disables the entire handrail drive assembly.

It is an object of this invention to provide an improved handrail drive assembly which is capable of providing sufficient traction for a belt type conveyor handrail regardless of the length of the conveyor.

It is another object of this 26 invention to provide a handrail drive assembly according to the above object in which each of a plurality of traction providing rollers operates independently of each other.

It is a further object of this invention to provide an improved handrail drive assembly in which the handrail is driven by the belt which forms the passenger riding surface without requiring the handrail to undergo a twist in its return run.

Other objects, features and advantages of the invention will become apparent to those skilled in the art upon considering the following description in conjunction with the appended drawings and claims.

In the drawings:

FIG. 1 is a schematic diagram in elevation of a conveyor employing the handrail drive assembly of this invention;

FIG. 2 is a plan view of a section of the conveyor of FIG. 1 showing the handrail drive assembly with parts omitted and parts cut away;

FIG. 3 is a sectional view of the conveyor of FIG. 1 taken along lines 3—3;

FIG. 4 is an end elevation in detail of a roller drive unit of the handrail drive assembly of FIG. 2.

Referring now to FIG. 1, the passenger conveyor of the belt type shown therein has a balustrade 10 on each side, each of which includes a transparent section 11 mounted above an opaque skirt panel section 12. Below the curved newel sections 13 and 14 at the ends of each balustrade 10 adjacent landing platforms 15 and 16 are the main driving pulleys 17 and the idler pulleys 18 for the belt 19.

Throughout the length of the conveyor and rotatably mounted on the truss thereof (not shown) are a plurality of support rollers 21. In typical fashion these are provided to support the riding surface of belt 19 throughout its exposed run. In the herein described embodiment one of these rollers 21 is disposed on each side of the conveyor substantially behind the skirt panel section 12 on its respective side. Each of these rollers has a diameter of 75 mm. and each is separated from its two adjacent rollers by a distance of 175 mm. measured from the axis of one to the axis of the other.

Also disposed below transparent portion 11 of balustrade 10 on each side of the conveyor and behind each opaque skirt panel section 12 are I-beams 22 which form part of the truss member. In the disclosed embodiment these I-beams 22 are separated one from the other by a distance of 1.4 meters along the length of the truss. Connected to every fourth I-beam is a drive roller unit 23 (FIG. 4) for handrail 24. Located beneath the two newel sections 13 and 14 are handrail guiding rollers 25, 26 and 27. In addition a spring biased tensioning roller unit 28 for urging the handrail downwardly on its return run and thereby maintaining the proper tension in it, is located under the newel section 14. The guiding rollers 25, 26 and 27 and the tensioning roller unit 28 are all mounted on the supporting truss in any suitable manner.

As can be seen from FIGS. 2, 3 and 4 the belt support roller 21 at the location of each drive roller unit 23 on each side of the truss is fitted on a shaft 30 and locked in position thereon against rotation by set screw 31 which engages milled flat 32. Welded to each shaft 30 is handrail guiding and driving roller 33. Each shaft 30 is mounted on its associated I-beam 22 by means of self-aligning pillow block bearings 34 and 35. Each bearing 34 is fastened to an angle iron (not shown) by bolts 36 and 37. Each angle iron extends from a flange of its associated I-beam 22 located on the outer side of the truss and is fastened thereto by bolts 38 and 39 which pass through slots (not shown) in the flange disposed parallel to the longitudinal axis of the truss to permit longitudinal alignment of each bearing 34 with its corresponding bearing 35. Spring washers 41 and bolts 42 on each side of each bearing 35 resiliently fasten it to its associated angle iron 43, each of which is itself fastened by bolts 44 to a bracket (not shown) which extends from and is fastened to a flange of the associated I-beam 22 located on the inner side of the truss. Shims 45 on each side of each pillow block bearing 35 between it and its associated angle iron 43, as necessary, produce initial vertical alignment of each bearing 34 and its corresponding bearing 35.

Also connected to each angle iron 43 by means of pins 46 is an associated plate 47. Welded to each of these plates is a stationary shaft 48, each of which, at its one end, is fastened to an angle iron 50 by means of bolt 51. Each angle iron 50 is fastened to the conveyor truss in any suitable manner. Rotatably mounted on the interior end of each shaft 48 in position to engage the riding surface of belt 19 beneath the associated supporting roller 21 of each drive roller unit 23 is a cooperating belt idler roller 52. Similarly mounted on the other end of each shaft 48 and disposed beneath the associated handrail guiding and driving roller 33 is a cooperating handrail idler roller 53. Both belt idler roller 52 and handrail idler roller 53 of each drive roller unit 23 are of the ball bearing type. A cutout 54 is provided in each I-beam 22 to permit handrail 24 to pass therethrough on its return run.

With this arrangement by tightening down on bolts 42 on each side of each pillow block bearing 35 the belt support roller 21 of each drive roller unit 23 is brought into engagement with the underside of belt 19 on its return run resiliently clamping the belt between the support roller and its associated belt idler roller 52. In this way the motion of the belt on its return run imparts rotation to support roller 21 of each unit 23. The resilient pressure applied to each shaft 30 by its associated pillow block 35 also urges each handrail guiding and driving roller 33 into engagement with handrail 24 clamping the handrail between rollers 33 and their associated handrail idler rollers 53. Thus traction is developed between roller 33 of each drive roller unit 23 and handrail 24 to drive the handrail in synchronism with belt 19.

To improve the traction relationship between belt **19** and support roller **21** of each unit **23** and between handrail **24** and each roller **33**, each of these rollers **21** and **33** is made with a tire composed of an elastomer material. Suitable elastomers include both rubber and polyurethane. Handrail idler roller **53** is made with either a tire of polythetraflouroethylene or is suitably coated with this substance to provide a frictionless engagement for the exposed gripping surface of handrail **24**.

From the foregoing it can be seen that suitable tractive drive can be provided for a conveyor handrail by the present invention regardless of the length of the conveyor because the number of handrail drive roller units increases proportionally with increases in the length of the conveyor. Moreover it is evident that because each of the drive roller units derives its motive power independently of the others the failure of a single power take-off device is unlikely to produce a shutdown of the conveyor.

Although in the presently preferred embodiment of this invention the drive roller units on each side of the conveyor are separated by 5.6 meters, other arrangements which are considered satisfactory are within the skill of the art. Thus arrangements in which a plurality of units are mounted at either or both ends of the belt are deemed suitable and may be desirable.

Other variations within the scope of the invention will also occur to those skilled in the art. It is intended, therefore, that all matter contained in the above description or shown in the accompanying drawing be interpreted as illustrative and not limiting in any sense.

What is claimed is:

1. In a passenger conveyor having a movable endless conveyor belt joining two landing platforms and providing an exposed riding surface for passengers traveling between the platforms, said belt having a return run disposed beneath its riding surface, a truss mounted between said platforms, main driving means driving said belt between said platforms, a plurality of support rollers rotatably mounted along the length of said truss and supporting the riding surface of said belt, a balustrade between said platforms including a curved newel section adjacent each platform, said balustrade being supported by said truss, an endless C-shaped handrail movable in an exposed run from one newel section to the other over the entire periphery of said balustrade, said handrail having a return run disposed beneath its exposed run, and a handrail drive assembly driving said handrail, wherein the handrail drive assembly includes a plurality of drive roller units disposed between said platforms and rotatably supported by said truss, each drive roller unit including one of the belt support rollers and a handrail guiding and driving roller, the belt support roller of each drive roller unit engaging said belt and being rotated thereby and rotatably driving its associated handrail guiding and driving roller, each said handrail guiding and driving roller engaging said handrail to guide it and drive it on its return run.

2. In a passenger conveyor according to claim **1**, wherein the balustrade includes an upper transparent section over its entire length and a lower opaque skirt panel section beneath the transparent section, the drive roller units and the return run of the handrail both being disposed beneath the transparent section of the balustrade behind the opaque skirt panel section.

3. In a passenger conveyor according to claim **2**, wherein each drive roller unit includes a shaft journaled on said truss, the belt support roller and the handrail guiding and driving roller of each unit being fastened on the associated rotatable shaft.

4. In a passenger conveyor according to claim **3**, wherein each said drive roller unit includes a biasing means urging its associated belt support roller and handrail guiding and driving roller into engagement with said belt and said handrail, respectively, each said biasing means including a self-aligning pillow block bearing fastened to said truss and supporting said rotatable shaft, a stationary shaft fastened to said truss below and aligned with said rotatable shaft, a belt idler roller rotatably mounted on said stationary shaft beneath its associated belt support roller, a handrail idler roller rotatably mounted on said stationary shaft beneath its associated handrail guiding and driving roller, and a second self-aligning pillow block bearing resiliently fastened to said truss, said second pillow block bearing being disposed over and in contact with said rotatable shaft between its associated support roller and guiding and driving roller, said second pillow block bearing urging said support roller into contact with the underside of the belt on its return run and the exposed side, or riding surface thereof into contact with the belt idler roller thereby resiliently clamping the return run between said rollers, said second pillow block bearing also urging the guiding and driving roller into contact with the underside of the handrail on its return run and the exposed side thereof into contact with the handrail idler roller thereby resiliently clamping the return run of the handrail between its guiding and driving roller and its idler roller.

5. In a passenger conveyor according to claim **4**, wherein the support roller and the guiding and driving roller of each drive roller unit has an elastomer tire which contacts the belt and handrail, respectively.

6. In a passenger conveyor according to claim **5**, wherein each handrail idler roller has a peripheral surface of polytetraflouroethylene.

7. In a passenger conveyor according to claim **6**, wherein said elastomer is rubber.

8. In a passenger conveyor according to claim **6**, wherein said elastomer is polyurethane.

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