

- [54] **APPARATUS FOR GUIDING A CONVEYOR**
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 [22] Filed: **Nov. 23, 1970**
 [21] Appl. No.: **91,960**
- [52] U.S. Cl.198/16
 [51] Int. Cl.B66b 9/12
 [58] Field of Search.....198/16-17, 18;
 104/25

- [56] **References Cited**
UNITED STATES PATENTS
 2,813,613 11/1957 Margles.....198/16
- Primary Examiner*—Edward A. Sroka
Attorney—A. T. Stratton, C. L. Freedman and R. V. Westerhoff

[57] **ABSTRACT**
 The steps on a moving stairway are guided laterally by rollers bearing against the back of the skirts on either side of the stairway. The rollers are positively related to the steps to preclude an object from becoming wedged between the skirt and steps due to the effect of their relative movement.

6 Claims, 5 Drawing Figures

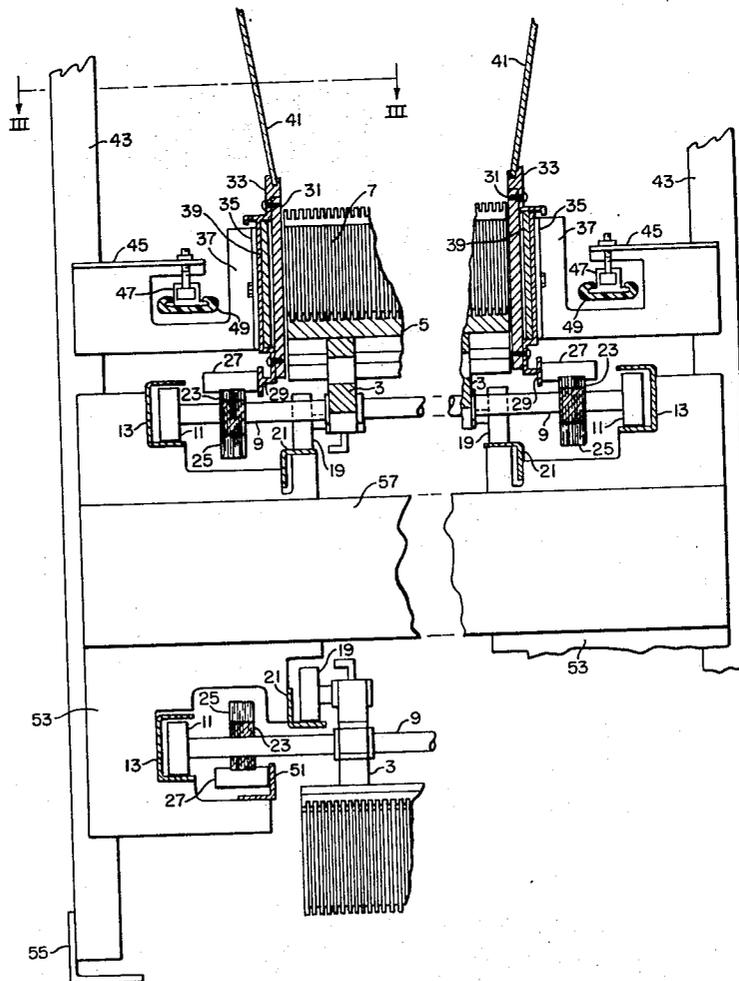


FIG. 1

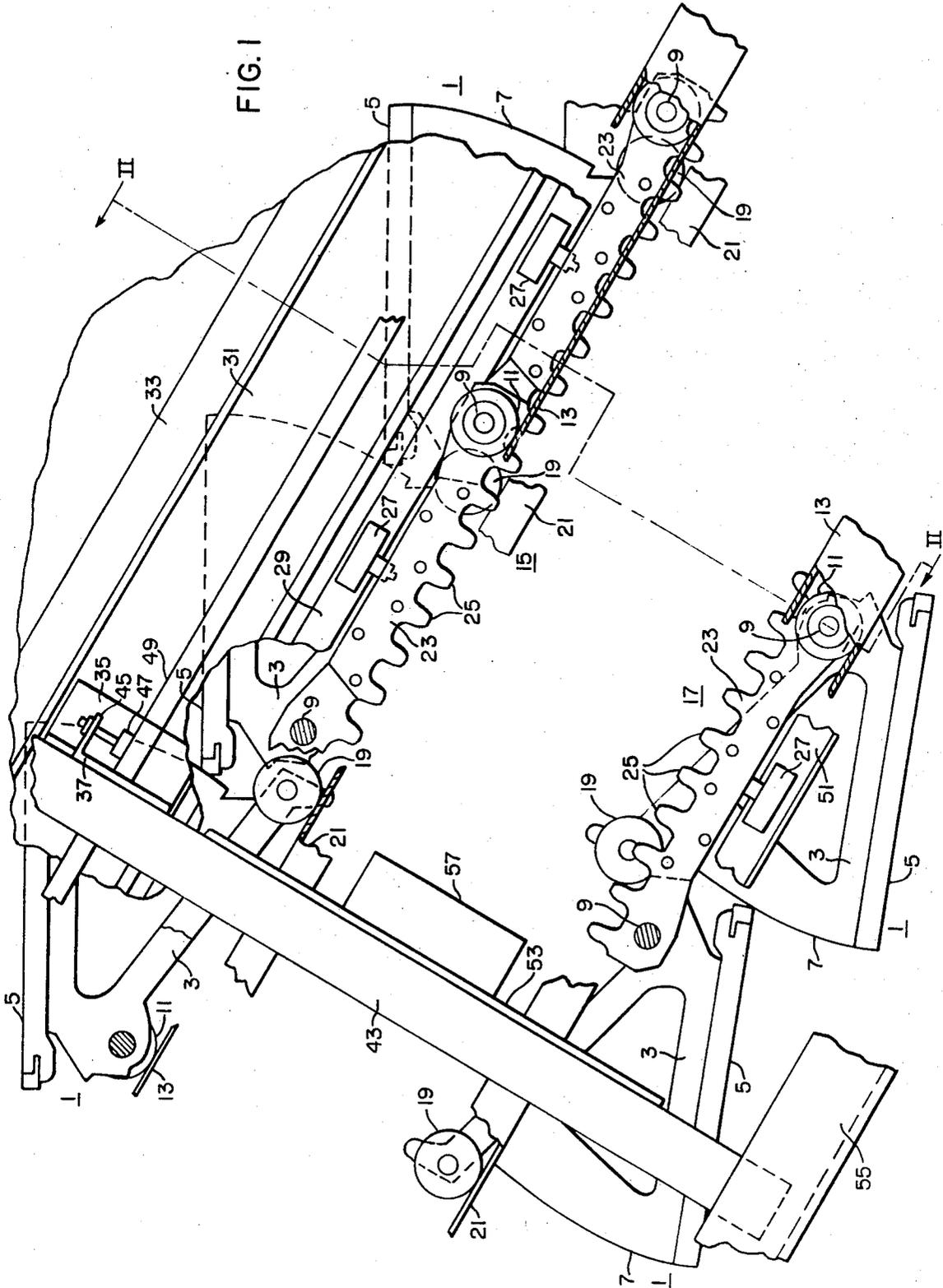
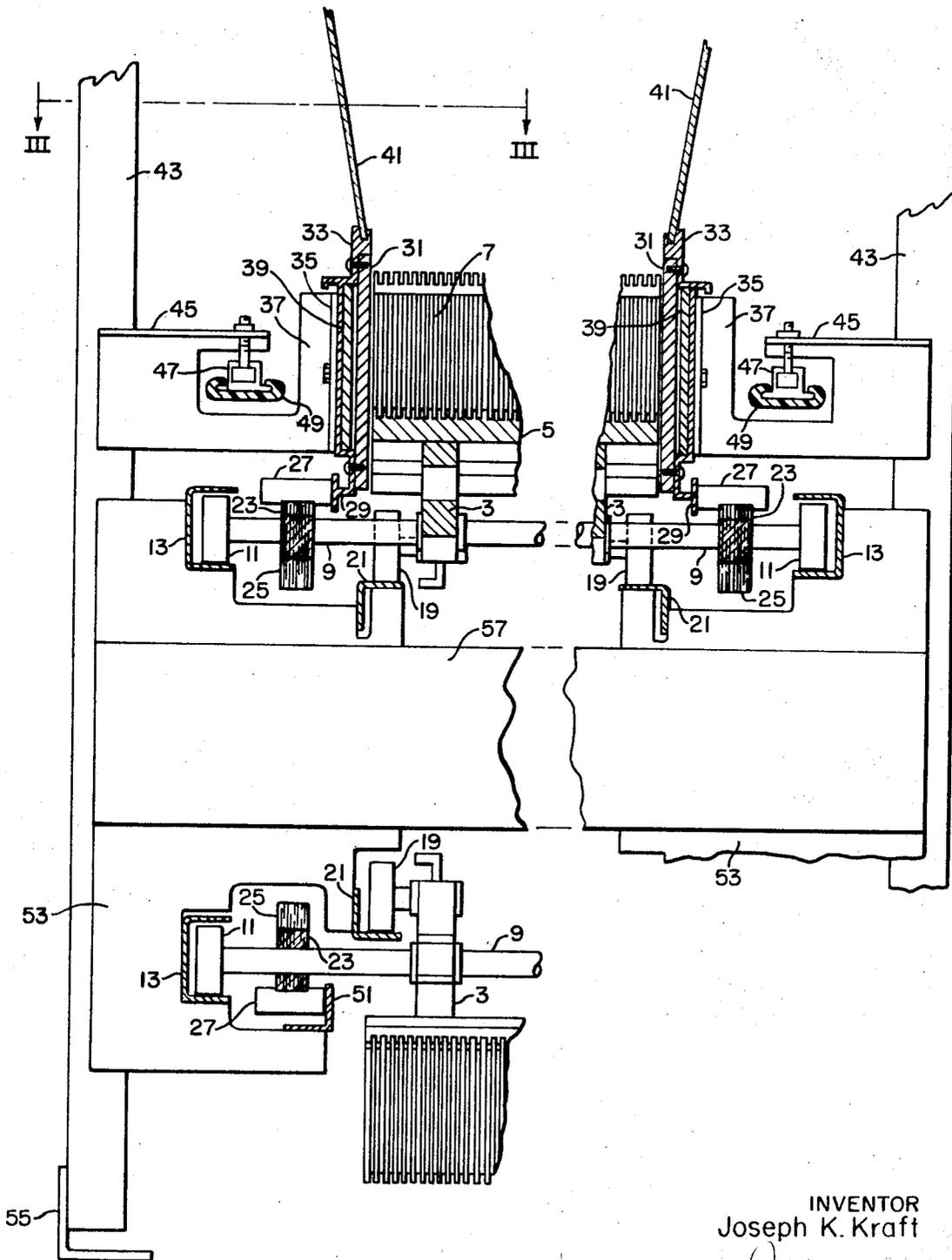


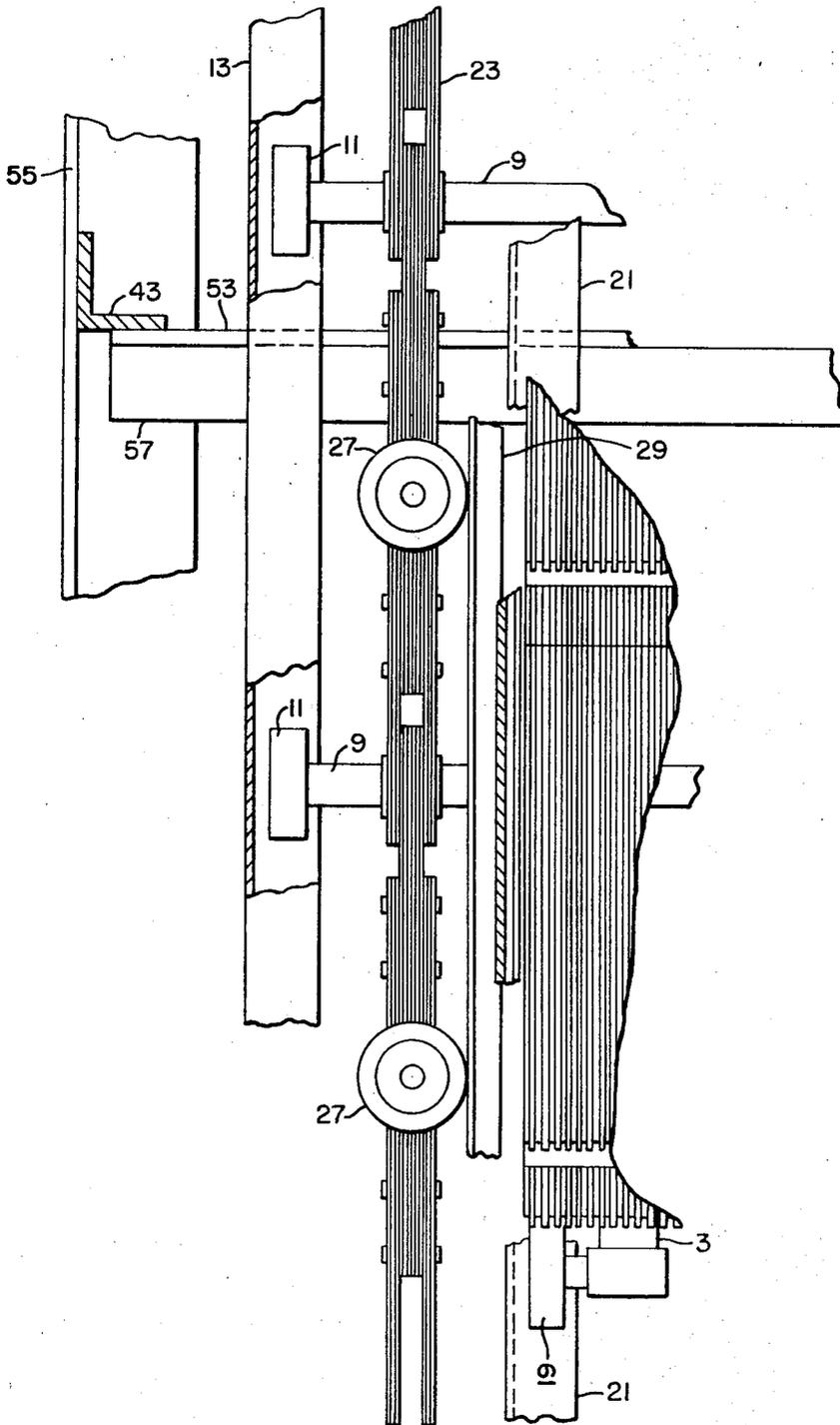
FIG. 2



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FIG. 3



APPARATUS FOR GUIDING A CONVEYOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to means for guiding a conveyor and more particularly such means adapted for use on passenger conveyors.

2. Description of the Prior Art

The steps of a conventional moving stairway are generally guided laterally by the confines of the tracks in which the main rollers move. Since lateral guidance is thus provided by the sides of the main rollers, frequent lubrication is necessary to reduce wear and noise.

The conventional manner of laterally guiding the steps has other drawbacks. Since the step and the skirts forming the vertical walls adjacent the steps are not directly related to each other, objects have been known to be drawn into the gap between the skirts and the step despite the close running clearances required by code. The skirt is deflected by the trapped object through the wedging action of the relative movement between the step and the skirt. In addition, the step is deflected from the skirt as the running clearance between the side of the main roller and the track is taken up.

Efforts have been directed toward reducing the running clearances between the steps and the skirts in order to eliminate such difficulties; however, soft pliable objects continue to be drawn into the gaps. Another approach has been to provide switches which are operated to cut off power to the driving motor when the skirts become deflected a predetermined amount.

The use of auxiliary wheels to provide limited lateral guidance to the steps of a moving stairway for other purposes has been taught in the prior art. U.S. Pat. Nos. 829,152; 1,984,801 and 2,535,501 suggest the use of fixedly mounted rollers on either side of the stairway at the top and bottom to laterally guide the steps into the combplates only. Rollers mounted on the sides of each step of the moving stairway are disclosed in U.S. Pat. No. 2,641,351, however, these rollers were provided mainly for absorbing the lateral forces developed in a circular moving stairway. U.S. Pat. No. 2,813,613 discloses the use of casted wheels mounted on either side of the step frames which bear outward against the skirts to standardize the clearance between the skirt and the steps. No effort was made in any of these prior art patents to positively clamp the lateral positioning of the steps with respect to the skirts.

SUMMARY OF THE INVENTION

According to this invention, the endless belt of the conveyor is guided laterally directly from the back side of the skirts forming the vertical walls along the edges of the endless belt. The linkages between the endless belt and the skirts are spaced at frequent intervals and are kept relatively short to preclude objects from wedging between the skirt and the endless belt and being drawn into the gap as the components deflect.

As applied to a moving stairway, guides protruding under the skirts on either side of each step, support rollers which bear against the back sides of the skirts. With the rollers preferably mounted on rigid linkages pivotally connected to the step axles, the rollers will follow the curvature of the step path without the necessity of swivel mountings. Tracks against which the

guide rollers bear on the return run provide lateral guidance for the steps on this run.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings illustrate an exemplary embodiment of the invention wherein:

FIG. 1 discloses a side elevation view with parts in section and parts broken away of a moving stairway incorporating the invention;

FIG. 2 illustrates a sectional view taken transverse to the direction of movement of the stairway along the line II—II in FIG. 1;

FIG. 3 is a plan view with parts in section and parts broken away of a portion of the moving stairway taken along the line III—III in FIG. 2;

FIG. 4 is a schematic view of a moving stairway; and
FIG. 5 is a simplified elevation view with parts broken away and parts missing of the lower terminal of a moving stairway incorporating the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, the moving stairway is made up of a plurality of steps identified by the general reference character 1. Each step unit is made up of two vertically oriented generally triangular shaped frame members 3, one on either side of the step unit, a tread plate 5 upon which the passengers are carried and a riser 7. Preferably the tread plate 5 and the riser 7 are cleated. Each step is pivoted for rotational movement about a step axle 9 passing through the frame members 3. The steps are journaled to the axles in a manner which prevents axial movement between the step and the axles. Main rollers 11 rotationally mounted to each end of the step axles ride in C-shaped tracks 13 on both the upper load bearing run 15 and the return run 17 of the stairway. Journaled to the step frames 3 adjacent the bottom of the risers 7 are trailer wheels 19 which are guided by L-shaped trailer tracks 21 on both the upper run 15 and the return run 17.

The individual steps are interconnected to form an articulated endless belt by rigid linkages 23 pivotally connected to the step axles on either side of the steps. The linkages 23 are constructed of laminations of steel stampings having projections 25 which form teeth. The linkages have male and female connectors on opposite ends so that they cooperate with adjacent linkages to form a continuous rack. Drive units which are spaced at intervals along the length of the stairway mesh with the rack teeth on both the upper and return run to impart a driving force to the stairway. The drive units and the rack assemblies are more fully described in the copending application Ser. No. 91,959 filed Nov. 23, 1970, of this inventor and Henry Boltrek assigned to the same assignee as this application.

Guide rollers 27 are mounted on the linkages 23 for rotation about an axis transverse to the longitudinal axis of the linkages. On the upper run 15, the guide rollers 27 roll against extruded skirt guides 29 as the stairs move either upward or downward. The skirt guides 29 are connected to the bottom of the skirts 31 which form a substantially vertical wall along either side of the stairway. The upper ends of the skirts are connected to extruded balustrade supports 33 which run along the upper edge of the skirts. The skirt guides and

the balustrade supports 33 are supported by flanges 35 on brackets 37. The skirt guides 29 and the balustrade supports 33 are clamped in place by retainer plates 39 which are bolted to the flanges 35 on the brackets 37. The balustrade supports 33 give continuous support to the balustrades 41.

The brackets 37 are welded to the truss chord members 43. The brackets 37 have horizontal flanges 45 which support the return guides 47 for the hand rails 49. The upper runs of the hand rails (not shown) are connected to the top of the balustrades where they are available to give support to passengers on the stairway.

The guide rollers 27 bear against the vertical legs of the L-shaped lateral guides 51 to positively impart lateral guidance to the steps on the return run.

The C-shaped tracks 13 for the main rollers, the L-shaped tracks 21 for the trailer rollers and the lateral guides 51 are all precision welded to mounting plates 53 on their respective sides of the stairway. The mounting plates 53 in turn are welded to the truss chord members 43. The truss chord members are welded to the lower truss beam members 55 at their lower extremity and at their upper extremity to upper truss beams (not shown). Other truss chord members (not shown) are located at intervals of four feet along the length of the stairway. Diagonal truss members (not shown) give added strength to the supporting truss structure. The two sides of the truss structure are rigidly connected by the boxing members 57 which are welded to the mounting plates 53.

With the skirts 31 rigidly held by the brackets 37 located only every four feet along the stairway, it would be possible for the sheet material from which the skirt is formed to be deflected away from the steps, especially at the point midway between support brackets. This is exactly what occurs on the conventional moving stairway. In the conventional stairway the problem is further compounded by the fact that since the steps are being laterally guided by the edges of the main rollers 11 bearing against the sides of the C-shaped track 13, when an object is forced into the space between the skirt and the step the step moves laterally away from the skirt by the amount of running clearance that is necessary.

According to this invention, with the step being guided laterally by the rollers 27 which bear against the backs of the skirts through the skirt guides 29, there is a direct mechanical linkage between the step and the skirt. Furthermore, with the guide rollers spaced 16 inches apart (the length of a linkage 23) deflection of the skirt through bending is greatly reduced.

Up to this point reference has been made to specific details of the inclined section of the stairway. As shown in FIG. 4 the upper load bearing run 15 and the return run 17 are joined by lower terminal section 57 and upper terminal section 59 to form a closed endless path in a conventional manner. FIG. 5 illustrates, in partially schematic form, the essential relationship of the parts as the steps negotiate the radii of the lower terminal. As is conventional in moving stairways, the main rollers and trailer rollers of the steps take divergent paths as the lower terminal is approached so that the steps may be brought into platform relationship for passengers leaving the stairway on a downward traveling stairway or for entering the stairway on an upward traveling

stairway. It can be seen from FIG. 5 that since the linkages 23 are pivotally connected to the axles supporting the main rollers 11, that as the main rollers follow the curved path from the inclined portions to the horizontal portions and vice versa, the guide rollers 27 will roll along the curved sections of the skirt guides 29 on the upper run and the lateral guides 51 on the return run. Although the guides for the guide rollers 27 have been shown as being terminated short of the reversing curve, they could form a continuous guide. A similar turn around is provided at the upper terminal 59.

It will be apparent therefore, that there has been disclosed apparatus for laterally guiding the steps of a moving stairway with respect to the stairway skirts thereby minimizing the possibility of objects becoming wedged between the steps and the skirts.

I claim as my invention:

1. A moving stairway comprising:

an endless belt;
a supporting structure for supporting said endless belt for an upper load bearing run and a lower return run;

first and second skirts fastened to the supporting structure in spaced relation to form essentially vertical walls along the edges of the load bearing run of the endless belt;

stairway steps pivotally mounted on said endless belt, between said first and second spaced skirts; and
guide means extending laterally at spaced intervals from said endless belt, on predetermined sides of each of said first and second skirts which are opposite the step sides of the skirts, said guide means including guide rollers mounted for rotation against the predetermined sides of said first and second skirts;

whereby, the endless belt and the first and second skirts are directly coupled together at spaced intervals to provide a positive lateral guide for the endless belt along the load bearing run, and to preclude objects from spreading the skirts away from stairway steps and from becoming wedged between the skirts and the steps by relative movement between them.

2. The moving stairway of claim 1,

wherein the endless belt comprises a series of rigid linkages, a plurality of transverse axles for pivotally connecting said linkages and upon which the stairway steps are pivotally mounted, and main rollers on each end of each axle for supporting said linkages,

said combination wherein the guide rollers of the guide means extend from a plurality of said linkages.

3. The moving stairway of claim 2,

wherein the main rollers are mounted for rotation in a vertical plane parallel to the direction of movement of the endless belt;

and including a first set of tracks for giving vertical support to the main rollers.

4. The conveyor system of claim 3:

wherein the first set of tracks guide the main rollers for vertical positioning on the return run as well as in the load bearing run; and

including a second set of tracks having vertical guiding surfaces located on either side of the return

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run, said second set of tracks cooperating with the guide rollers to control the lateral positioning of the endless belt on the return run.

5. In a moving stairway:
 a supporting structure;
 a pair of spaced parallel flexible endless units composed of pivotally connected rigid linkages;
 a plurality of axles transverse to the flexible endless units for pivotally connecting corresponding adjacent rigid linkages in each flexible unit;
 main rollers on each end of each axle;
 a pair of tracks on the supporting structure for guiding the main rollers with respect to the supporting structure in an endless path;
 stairway steps pivotally connected to each axle between said flexible endless units;
 skirt means extending vertically downward from the supporting structure on either side of the steps

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between the steps and the flexible endless units forming essentially vertical walls along the edges of the steps; and

guide means connected to a plurality of corresponding linkages in each of said flexible endless units, said guide means bearing against the adjacent skirt, on the side of the skirt opposite to the step side;

whereby the steps are laterally guided by the cooperative guide means and skirts and objects on the steps cannot become drawn into the space between the step and the skirts by spreading the two apart.

6. The moving stairway of claim 6 wherein the guide means comprises rollers mounted for rolling against the sides of the skirts away from the steps.

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