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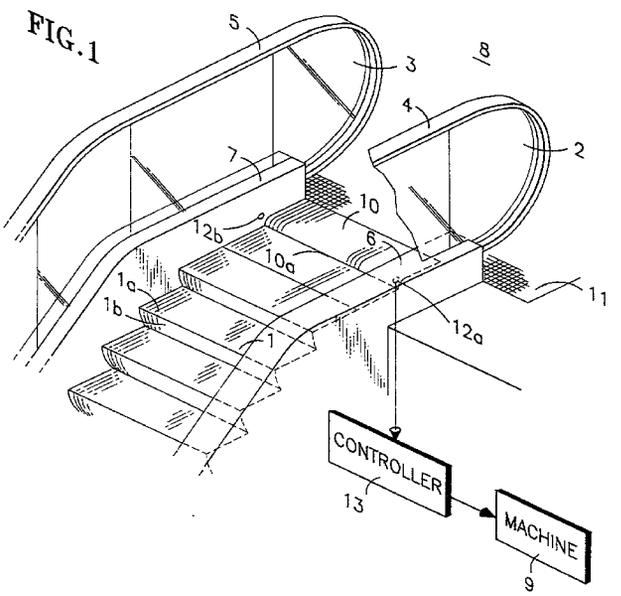
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(54) Safety apparatus for a passenger conveyor

(57) A safety device for a passenger conveyor includes a timer connected to a passenger detecting sensor disposed proximate to the combplate of the conveyor. If the sensor detects the continued presence of a passenger for a time period exceeding a predetermined time threshold, the passenger conveyor is stopped.

FIG. 1



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Description

Technical Field

The present invention relates to passenger conveyors, and more particularly to safety devices for passenger conveyors such as escalators and moving walks.

Background of the Invention

Passenger conveyors, such as escalators and moving walks, include a plurality of sequentially connected platforms that move through a closed loop path. The platforms may be either escalator steps or moving walk pallets. Passengers entering the conveyor step onto a platform that emerges from under a combplate and are carried by the platform to a second landing. At the second landing, the passengers exit the conveyor by stepping off the platform. The platforms go underneath another combplate and around a sprocket for the return to the first landing.

Passenger safety is a concern at the juncture between the combplate and approaching platforms. Foreign objects, such as loose hanging clothing, may become lodged between the platform and the combplate. To prevent injury to passengers conveyors have been fitted with switches that actuate if the combplate undergoes an abnormal force or impact. Upon actuation of the switches, the conveyor is stopped to permit removal of the foreign object. Unfortunately, the sensitivity of the switches subjects them to undesirable false shut-downs of the conveyor. This may occur if a heavy object, such as luggage, impacts on the combplate.

The above art notwithstanding, scientists and engineers under the direction of Applicant's Assignee are working to develop safety devices that prevent injury to passengers and minimize false shut-downs of the passenger conveyor.

Disclosure of the Invention

According to the present invention, a safety device includes a timer connected to a passenger detecting sensor disposed proximate to the combplate. If a passenger is detected for a time period exceeding a predetermined time threshold, the passenger conveyor is stopped.

According to a specific embodiment, a passenger conveyor is equipped with: a comb that is arranged on the exiting side; platforms that move underneath this comb; a photosensor that is arranged very close to the front edge of the aforementioned comb; a driving device which moves the platforms from the entering side to the exiting side, and a controller that controls the driving device and is equipped with a timer, and an instruction to stop driving, which is sent out from the controller to the driving device after the time in which an object that is detected by the photo-sensor exceeds a predetermined time threshold.

The feature of the timer connected to the passenger detecting sensor provides the advantage of preventing injury to passengers while minimizing false shut-downs of the passenger conveyor. If an object becomes lodged between the combplate and step, the sensor will detect the continued presence of the passenger associated with the object and, after the timer threshold expires, shut down the conveyor. This device avoids the false shut downs associated with mechanical switches connected to the combplate.

The foregoing and other objects, features and advantages of the present invention become more apparent in light of the following detailed description of the exemplary embodiments thereof, as illustrated in the accompanying drawings.

Brief Description of the Drawings

Figure 1 is a perspective view which illustrates an embodiment of an escalator having a safety apparatus according to the present invention.

Figure 2 is a cross-sectional side view of the escalator of Figure 1.

Best Mode for Carrying Out the Invention

The present invention will be explained with reference to the figures below. Figure 1 as well as Figure 2 are diagrams which illustrate a particular embodiment of a safety apparatus according to the present invention as applied to an escalator.

In Figure 1, the escalator includes steps 1, and these steps (1) are attached to a step chain (not illustrated). A pair of balustrades 2,3 are vertically installed on both sides of the steps 1, and hand rails 4,5 are provided over the balustrades 2,3. Skirt guards 6,7 are provided at the lower part of the balustrades 2,3.

Also, each step 1 is equipped with a tread 1a on its top face, and a riser 1b on its front face, and grooves are formed on them in the direction in which they move. Steps 1 are moved from the entering side to the exiting side 8 by a machine 9 (driving device). During this, the steps 1 come out from underneath the comb at the entering side (not illustrated), move to the exiting side 8, and they go underneath a combplate 10 that is arranged on a floor plate 11 at the exiting side 8 as illustrated in Figure 2.

The front edge 10a of the comb 10 is formed into the shape of a comb, and this front edge engages with the grooves that are formed in the tread 1a of the step 1. A photosensor 12, which consists of a light-emitting element 12a and a light-receiving element 12b, is provided at the skirt guards 6,7 immediately adjacent to the front edge 10a of the comb 10. Thereby, a light beam is projected into the light-receiving element 12b from the light-emitting element 12a along the front edge 10a of the comb 10. The photosensor shown in Figs. 1 and 2 is an exemplary embodiment of a passenger detecting sensor. Other types of passenger detecting sensors may

also be used to carry out the invention.

If an object happens to be caught between the comb 10 and the step 1, this object, which is being detected by the photosensor 12, is always positioned over the front edge 10a of the comb 10. Therefore, since the light that is projected from the light-emitting element 12a runs immediately adjacent to the front edge 10a of this comb 10, this light beam is continually interrupted. In this way, as the object, which is being detected, is detected by the photosensors 12a, 12b, this signal is output to a controller 13, and this detection time is counted by a timer at the controller 13 by the subtraction method. The legs of passengers also pass the front edge 10a of the comb 10, and therefore, the passenger's legs are also detected. The detection time, however, for the passengers is minimal, i.e. less than 1 second. When the object that is being detected by the photo-sensors 12a,12b happens to be caught at the front edge 10a of the comb 10, the detection time is significantly longer, i.e. more than 1 second. A signal for stopping the operation of the escalator is output from the control panel 13 to the machine 9 when the detection time exceeds a predetermined time threshold. A suggested amount for the time threshold is 5 seconds, although the setting of the time threshold can vary according to the operational condition. It should be noted that the operational efficiency of the escalator decreases when the escalator comes to frequent stops.

Although an example of an escalator was used as an embodiment of a passenger conveyor, it should be apparent to those skilled in the art that the invention is also applicable to moving walks.

Although the invention has been shown and described with respect to exemplary embodiments thereof, it should be understood by those skilled in the art that various changes, omissions, and additions may be made thereto, without departing from the spirit and scope of the invention.

Claims

1. A safety device for a passenger conveyor, the passenger conveyor including a combplate disposed at an exit of the passenger conveyor, a plurality of platforms that engage the combplate, and a machine engaged with the platforms to drive the platforms, the safety device including:

   a passenger detecting sensor disposed proximate to the combplate: and
   a timer connected to the passenger detecting sensor and triggered by the presence of a passenger proximate to the combplate, the timer including a predetermined time threshold such that upon expiration of the time threshold the machine is stopped.

2. The safety device according to Claim 1, wherein the passenger conveyor further includes a controller that controls the operation of the machine, and wherein the controller includes the timer.

3. The safety device according to Claim 1 or 2, wherein the passenger detecting sensor includes a light emitting device that directs a light along the front edge of the combplate, and a light receiving device that receives the light emitted from the light emitting device.

FIG.1

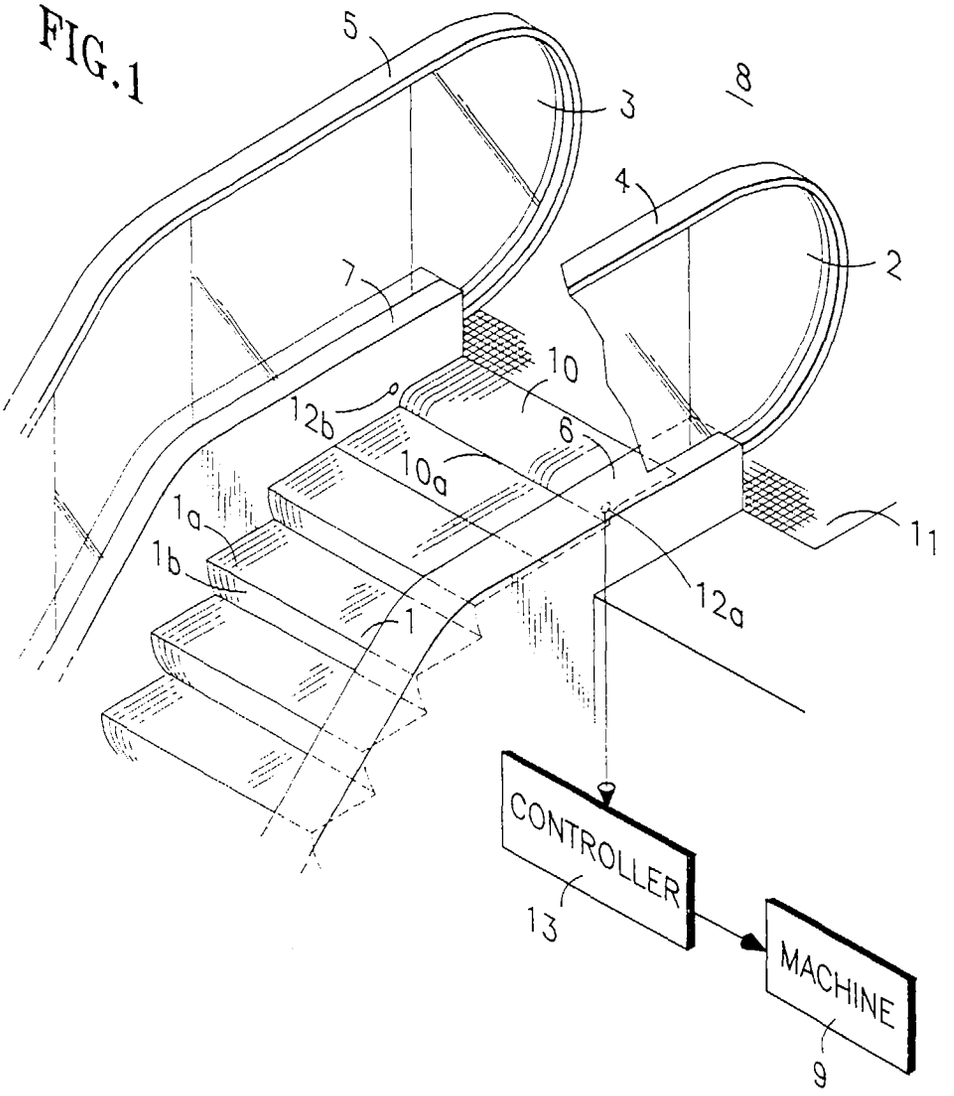
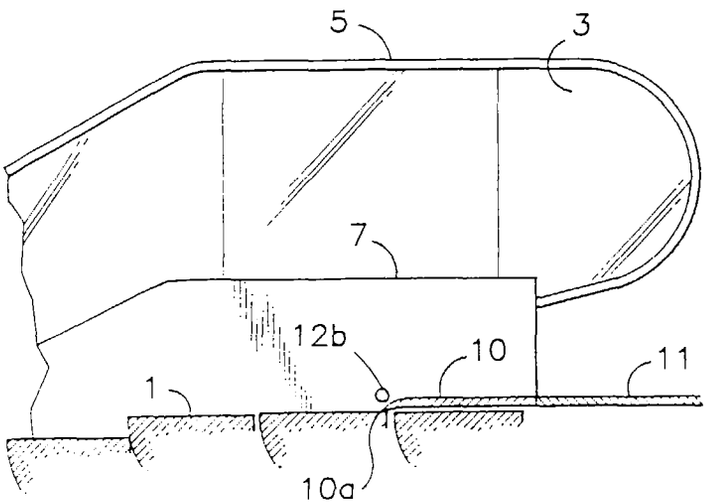

5
3
8
4
2
7
10
12b
6
10a
1a
1b
1
11
12a
CONTROLLER
13
MACHINE
9

FIG.2


5
3
7
12b
10
11
1
10a