

Title of the Invention

STALL DETECTOR FOR A HANDRAIL OF A PASSENGER CONVEYER

5 Background of the Invention

The present invention relates to a passenger conveyer used as an escalator or electrical moving road, especially relates to a passenger conveyer having a handrail belt speed default detector for detecting a speed-down of a
10 handrail in a passenger conveyer such as an escalator, a man-conveyer and the like.

In recent years, a lot of passenger conveyers are installed in department stores, railway stations and so on, and number of their users has been growing. In such a
15 situation, passenger conveyer trouble may cause an unexpected accident. Especially, for a passenger riding on a passenger conveyer with holding its handrail belt, speed-down of the handrail belt has a danger of falling. In order to avert the danger, a handrail belt speed default detector
20 for detecting a speed-down of a handrail is provided in a passenger conveyer.

It is known that a conventional handrail belt speed default detector for a passenger conveyer is disclosed in Japanese Patent Application Laid-Open No.63-143191. The
25 detector is shown in FIG.6.

The handrail belt speed default detector shown in this reference may be installed inside of the handrail belt and

there is no need to provide a large space for installing it. But it is difficult to provide a handrail belt speed default detector which operates in stable for a long time.

5 Summary of the Invention

A first object of the present invention is to provide a passenger conveyer having a handrail belt speed default detector for detecting a handrail belt speed default in stable for a long time.

10 A second object of the present invention is to provide a passenger conveyer having parts thereof having a long life.

In order to attain these objects, a passenger conveyer having an endless handrail belt having a sectional shape of letter C, plural steps for carrying passenger moved with
15 said endless handrail belt and a handrail belt speed default detector for detecting a speed-down of said endless handrail belt by detecting a moving speed of the endless handrail belt is provided, wherein said passenger conveyer
20 comprises a speed default detecting portion of the handrail belt speed default detector, said speed default detecting portion supported to one end of a rocking member which is freely supported on a fixed member, a roller which rolls by contacting inside of the handrail belt, and an electric
25 signal generating means for converting rotation of said roller into an electric signal, and wherein said roller is contacted to the handrail belt by self-weight of the roller

at a returning side of the handrail belt, and contacting point of the roller with the handrail belt, a bearing of the roller and a supporting point of the rocking member with the fixed member are disposed on a perpendicular line.

5 As said roller is contacted to the handrail belt by self-weight of the roller at a returning side of the handrail belt stated above, defacement of the bearing of the roller becomes small and the bearing of the roller has a long life.

10 Furthermore, as the contacting point of the roller with the handrail belt, the bearing of the roller and the supporting point of the rocking member with the fixed member are disposed on a vertical line, any force which badly effects is not added to the rocking member supporting
15 the roller, the bearing is not damaged.

Therefore, the long life of the passenger conveyer the handrail belt speed default detector in the present invention is obtained.

20 Brief Description of the Drawings

FIG.1 is a vertical cross-sectional front view showing an embodiment of a handrail belt speed default detector for a passenger conveyer in accordance with the present invention.

25 FIG.2 is a side view showing a passenger conveyer having the handrail belt speed default detector for a passenger conveyer shown in FIG.1.

FIG.3 is a side view showing the handrail belt speed default detector for a passenger conveyer shown in FIG.1.

FIG.4 is a block diagram showing a processing circuit of the handrail belt speed default detector for a passenger
5 conveyer shown in FIG.1.

FIG.5 is a block diagram showing a processing circuit of another embodiment of a handrail belt speed default detector for a passenger conveyer in accordance with the present invention.

10

Preferred Embodiments of the Invention

An embodiment of the passenger conveyer in the present invention will be described below, referring to the accompanied figures 1 to 3.

15 In both side of plural steps, not shown, for carrying passenger which moves with handrail 1 around which a handrail belt guide 2 is provided and on a downward of the handrail 1, a handrail belt guide 3 and plurality of rollers are provided.

20 A endless handrail belt 5 having a shape of letter C is guided by the handrail belt guide 2 on a forward moving side of the endless handrail belt 5 and is guided by the handrail belt guide 3 and the rollers 4 on a returning side of the endless handrail belt 5.

25 The handrail belt 5 is driven towards one direction by a drive mechanism 6 provided under the handrail 1.

On the returning side of the endless handrail belt 5,

a handrail belt speed default detector 7 for detecting speed default of the handrail belt 5 under the handrail 1.

This handrail belt speed default detector 7 is constructed with a speed default detecting portion 8 and a
5 rocking member 9 mounting the speed default detecting portion 8 on one end thereof. Other side of the rocking member 9 is supported in freely rotatable on a bearing 11 mounted on a supporting pin 10 fixed on a fixed member, and the rocking member 9 is freely rocked towards a moving
10 direction of the handrail belt 5.

The speed default detecting portion 8 is constructed with a roller 16 mentioned later, and an electric signal generating means 21 for converting rotation of said roller 16 into an electric signal.

15 On said one side of the rocking member 9, a bearing 12 is mounted on a bearing supporting portion 13, and central axis of the bearings 11 and 12 are disposed so as to correspond to a perpendicular line 14A.

A shaft 15 is inserted in the bearing 12 so as to be
20 freely rotated, and one end of the shaft 15, said roller 16 is mounted as a one body.

The roller 16 has a central portion 17 installed on the central shaft 15, a cylindrical portion 18 connected to the central portion 17 and disposed around the bearing
25 supporting portion 13 for the bearing 12, a large diameter portion 19 extended around the cylindrical portion 18 and having a same central axis as a central axis of the shaft

15, and a circular dumping member 20 having a high frictional coefficient provided around the large diameter portion.

5 The dumping member 20 is contacted behind of the handrail belt 5 and a contacting point of the dumping member 20 with the handrail belt 5 is positioned on the perpendicular line 14A in the same way as the central axis of the bearings 11 and 12.

10 On the other side of central shaft 15, the electric signal generating means 21 is installed, and constructed with a generator having a plural multi-poles magnets 22 mounted on the central shaft 15 and generating coil 23 facing to the plural multi-poles magnets 22 through a air gap.

15 The generating coil 23 is supported by the rocking member so as to keep the air gap constant.

20 The width W of roller 16 and the speed default detecting portion 8 is provided so as to be smaller than an openings 5M of the section of the letter C of the hand-rail belt 5.

In such a construction as above, as the rocking member 9 supported by the supporting pin 10 is hung down so that the end portion of the rocking member 9 is rotated down by a self-weight thereof, and the speed default detecting 25 portion 8 is inserted behind of the handrail belt 5 through the openings 5M and the circular dumping member 20 of the roller 16 contacts to the behind side of the handrail belt

5. Thereby, the self-weight of the speed default detecting portion 8 provides the circular dumping member 20 with a suitable contact pressure to the behind side of the handrail belt 5.

5 Here as shown in Fig. 3, the rocking member 9 is leaned with an arbitrary angle θ against a perpendicular line to a behind surface of the handrail belt 5 by moving the roller 16 towards a moving direction of the handrail belt 5, thereby height H_0 of installing space for the
10 handrail belt speed default detector 7 may be small and length L of the installing space becomes larger. However, there are enough space towards the moving direction behind the handrail belt 5, therefore the lower height H_0 of the installing space is desirable.

15 As stated above, the angle θ of the rocking member 9 is adjusted so as to the installing space minimum according to the installing position of the handrail belt speed default detector 7.

20 In such a condition, when the handrail belt 5 is actuated, the roller 16 is rotated with a speed according to the moving speed of the handrail belt 5.

25 The plural multi-poles magnets 22 is rotated by the rotation of the roller 16 through the central shaft 15, the generating coil 23 facing to the plural multi-poles magnets 22 generates a voltage proportional to the moving speed of the handrail belt 5. This generated voltage is used as a moving speed signal of the handrail belt 5.

Here in order to detect the moving speed signal in high accuracy, the generated voltage should be high by making the rotational speed of the roller high, therefore, diameter of the roller is designed so as to be small as the
5 handrail belt 5 moves with a predetermined constant speed.

As the speed default detecting portion 8 having the roller and the electric signal generating means 21 is positioned in the behind opening 5M of the handrail belt 5 having the width B, therefore, the small diameter of the
10 roller 16 is desirable when the high H of the installing space behind side of the handrail belt 5 is limited.

Furthermore usually, the passenger conveyer is continuously driven for a very long time, life of the bearing 12 supporting the speed default detecting portion 8
15 should be very long. As stated above, centers of the bearings 11, 12 and the contacting point of the roller to the handrail belt 5 are positioned on the same perpendicular line, thereby any wrong rotational moment is not added to the bearings 11, 12 and the long life of the
20 bearing is provided. Further, the smooth rotation of the roller 16 and smooth rocking of the rocking member are attained without any problem, thereby a detecting accuracy of the handrail belt speed default detector becomes stable.

Fig. 4 shows a processing circuit for processing an
25 output from the electric signal generating means 21.

A pair of electric signal generating means 21L, 21R are respectively provided behind of a pair of handrail

belts which are respectively disposed on the handrails 1 respectively provided on the left side and right side of the passenger step, and voltages generated from the electric signal generating means 21L, 21R are respectively
5 compared with a predetermined value at a voltage level judging circuit 24, and if they are normal, normal signal "1" is outputted, and if they are not normal, speed default signal "0" is outputted .

In the next, the output signals from the voltage level
10 judging circuit 24 is added to a logic circuit 25, and when any one of the electric signal generating means 21L and 21R generates the speed default signal "0", a gate circuit 26 generates a speed default detection signal.

A relay 28 of an output circuit 27 is actuated based
15 on the speed default detection signal so as to close a contact point, thereby the speed default is displayed, a warning signal is generated or the passenger conveyer is stopped.

Fig. 5 shows a another embodiment of a processing
20 method of the output signal from the electric signal generating mean.

When any one of the electric signal generating means 21L and 21R generates the speed default signal "0", a timer element generates the speed default detection signal at
25 first through a gate circuit 31 after a predetermined time has passed.

The timer element 30 is connected to a contact point

32 which closes when the passenger conveyer starts to move, and the output signal from the gate circuit 31 is invalidated between a predetermined time after the passenger conveyer starts to move, that is, while the speed
5 of the handrail belt becomes the predetermined speed after the passenger conveyer starts to move.

The output circuit 27 in Fig. 5 works based on the output from the gate circuit 31 in the same way as that in Fig. 4.

10 As stated above, as the output signal from the gate circuit 31 is invalidated while the speed of the handrail belt becomes the predetermined speed after the passenger conveyer starts to move, a miss to display the speed default, a miss to generate the warning signal or a miss to
15 stop the passenger conveyer happened before the speed of the handrail belt becomes the predetermined speed is prevented.

By the way, a electric generator is used as the electric signal generating means in the above embodiments
20 of the present invention, and any other conventional electric signal generating means may be used in same way.

Further, there is always no need for the width W of the speed default detecting portion 8 to be smaller than the openings B of the handrail belt 5 and at least the
25 width of the roller 16 contacted with the behind surface of the handrail belt 5 should be smaller than the openings B of the handrail belt 5.

Further, in stead of the circular dumping member 20 around the roller 16, a knurling may be provided around outer circular surface of the roller 16.

5

10



Claims;

1. A passenger conveyer having an endless handrail belt having a sectional shape of letter C, plural steps for carrying passenger moved with said endless handrail belt
5 and a handrail belt speed default detector for detecting a speed-down of said endless handrail belt by detecting a moving speed of the endless handrail belt, wherein said passenger conveyer comprising

a speed default detecting portion of the handrail belt
10 speed default detector, said speed default detecting portion supported to one end of a rocking member which is freely supported on a fixed member,

a roller which rolls by contacting inside of the handrail belt, and

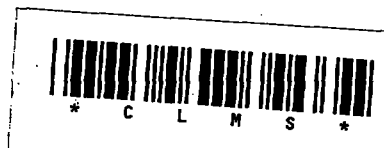
15 an electric signal generating means for converting rotation of said roller into an electric signal, wherein

said roller is contacted to the handrail belt by self-weight of the roller at a returning side of the handrail belt, and

20 contacting point of the roller with the handrail belt, a bearing of the roller and a supporting point of the rocking member with the fixed member are disposed on a vertical line.

25 2. A passenger conveyer having a handrail belt speed default detector according to claim 1, wherein

said one end of said rocking member is provided a



central axis, one side of said central axis being installed said roller and other side of said central axis being installed a rotating member of the electric signal generating means.

5

3. A passenger conveyer having a handrail belt speed default detector according to said any one of claims 1 and 2, wherein

said rocking member is leaned so that said roller
10 traces a moving of the handrail belt than .

4. A passenger conveyer having a handrail belt speed default detector according to claim 2, wherein

said rocking member has a bearing supporting portion
15 for supporting said bearing thereinside,

said roller has a central portion mounted on said one end, a cylindrical portion provided around the bearing, a large diameter portion around the cylindrical portion having a central axis which is equal to said central axis
20 provided on said rocking member, and a dumping member provided around the large diameter portion.

5. A passenger conveyer having a handrail belt speed default detector according to claim 1, wherein said
25 passenger conveyer comprising

an invalidating means for invalidating an output signal from said electric signal generating means in a



predetermined time when the passenger conveyer starts.

6. A handrail belt speed default detector for a passenger conveyer according to claim 2, wherein an elastic ring is provided in the contact portion of said roller to said
5 handrail belt, and said elastic ring is arranged on the axis line passing the supporting point of the lever.