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TITLE OF THE INVENTION

PASSENGER CONVEYER

BACKGROUND OF THE INVENTION

5 This invention relates to a passenger conveyer such as
an escalator or the like and, more particularly, to a
passenger conveyer applied to floors for getting on and off
(hereunder, simply referred to as floors), each of which
has a horizontal running range of two steps or less for the
10 steps going in and out of the floor at the forward end of
the floor.

A conventional conveyer which has steps each having a
surface provided thereon with a member different in color
is disclosed in JP A 58-125585. Further, a passenger
15 conveyer also is known in which comb plates each provided
at the forward end portion of a floor are colored in yellow
or the like and used as boundary lines for taking off of
passengers.

The above-mentioned conventional techniques each have
20 an effect of discriminating steps from the floor,
preventing a passenger from stepping onto a step with his
take-off foot by mistake, and preventing a passenger from
falling down by stepping onto an edge of the step when
moving from the floor onto the step. However, in some
25 cases, it induces such a trouble that a passenger falls
down when he steps, with a large stride, onto the step
which has left the comb plate and gone up or down to some
extent. Therefore, a counter measurement therefor has been

desired.

As a measure for preventing such a kind of fall, there is a method of making a large horizontal running range of steps going in and out of the floor at the forward end
5 portion thereof, for instance, a method of providing 3 to 4 steps running in the horizontal direction, however, the methods have troubles that an installation area of the passenger conveyer increases and becomes an obstacle against effective use of the floor area, further, that a
10 manufacturing cost increases, which becomes economical restriction to introduction of the passenger conveyer, etc..

SUMMARY OF THE INVENTION

15 An object of the present invention is to provide a passenger conveyer that a general passenger conveyer in which a horizontal running range of steps going in and out of a floor at the forward end of the floor is one or two steps is improved so as to be able to contribute to fall-
20 prevention when getting on and off, by correcting a take-off position and a stride and getting on.

In order to solve the above-mentioned problems, in a passenger conveyer which comprises a getting-on-off floor and a lot of steps connected to one another to be endless
25 and going in and out of the floor at the forward end of the floor, the present invention is provided with a take-off mark for displaying a place of a standing position for a passenger to take-off and get onto the above-mentioned

steps at a position of the floor distant by a prescribed distance from the above-mentioned forward end portion.

BRIEF DESCRIPTION OF THE DRAWINGS

5 Fig. 1 is a perspective view of a construction sectional in part in the vicinity of a way for getting on and out on one side of a passenger conveyer relating to a first embodiment of the present invention;

10 Fig. 2 is a diagram showing movement of a passenger on a passenger conveyer relating to a prior art;

 Fig. 3 is a diagram showing movement of a passenger on the passenger conveyer relating to the first invention;

15 Fig. 4 is diagram and graph showing measurement results showing relations between take-off distance A from a forward end of a comb plate 4 and a landing position B from the forward end of the comb plate 4;

 Fig. 5 is a diagram showing comparison of landing distance B between the first embodiment and the prior art;

20 Fig. 6 is a perspective view of a construction sectional in part in the vicinity of a way for getting on and out on one side of a passenger conveyer relating to a second embodiment of the present invention;

 Fig. 7 is a diagram showing movement of a passenger on the passenger conveyer relating to the second invention;
25 and

 Fig. 8 is a diagram showing comparison of landing distance B between the second embodiment and the prior art.

DESCRIPTION OF EMBODIMENTS OF THE INVENTION

First, a first embodiment of the invention is explained, referring to Figs. 1 to 5.

Fig. 1 is a perspective view of a construction sectional in part in the vicinity of a way for getting on and out (entrance and exit) on one side of a passenger conveyer relating to this first embodiment.

In Fig. 1, 1 denotes a passenger conveyer, 2 denotes a getting on and off floor (simply referred to as floor), 2A denotes a flat surface of the floor 2, 2B denotes an inclined surface that the flat surface 2A of the floor 2 inclines toward a tread face 3A described later, 3 denotes steps connected endlessly to one another and extending from the floor 2 to the other floor not shown, 3A denotes a tread surface of each step 3, 3B denotes a lot of concave grooves provided in the tread surface 3A, 4 denotes a comb plate provided a forward end of the floor 2 at the step side, 4A denotes a lot of tooth tip portions mounted on the forward end of the floor 2 on the step side and meshed with the concave grooves 3B of the step 3 in a non-contact condition, 4B denotes a root portion of the comb plate 4 mounted on the forward end of the inclined surface 2B of the floor 2, 5 denotes a getting in and off portion composed of the floor and the comb plate 4, and 6 denotes a take-off mark provided at a position distant a prescribed take-off distance L from the tip of the tooth tip portion 4B of the comb plate 4.

For the take-off mark 6, it is better to use rather

bright color having Munsell value of 3 or more, really difference of 5 to 6 in Munsell color system, generally used in coloring of the floor and comb plate 4, so as to easily discriminating the mark even by a passenger having
5 visual activity having weakened or even in the case where environmental illuminance is dark.

Next, movement of a passenger using the passenger conveyer when the conveyer is in elevation operation will be explained, referring to Figs. 1 to 3.

10 Here, Fig. 2 is an illustration showing movement of a passenger on a passenger conveyer, the comb plate of which is colored, relating to a prior art. Fig. 3 is an illustration showing movement of a passenger on the passenger conveyer relating to the present invention in the
15 case where the take-off mark 6 is provided at a position distant by a take-off distance L from the forward end the comb plate 4 downward the comb plate.

In Fig. 1, when a passenger walks on the floor 2 and gets on the step 3, he puts his take-off foot on a place in
20 the vicinity of the take-off mark 6, with consciousness of the color of the mark 6, and gets on the step. In this case, his landing foot opposite to the take-off foot lands on the tread face 3A of the step 3.

However, in the conventional passenger conveyer shown
25 in Fig. 2, in the case where a stride when getting on is a slightly large, he gets on a step 3A2 which is next to a horizontal step 3A1 and starts to take a difference in level therefrom, and an angle of the landing foot to the

body gravity G becomes 24° in this example, which is large, so that large force is necessary for the take-off foot to take off. On the other hand, in the passenger conveyer of the present embodiment shown in Fig. 3, since the take-off
5 mark 6 is provided, the landing foot gets on the horizontal step 3A1. Therefore, an angle of the landing foot to the body gravity G becomes 19° in this example, which is small, and force necessary for the take-off foot to take off is sufficient to be relatively small and stable getting on
10 becomes possible.

According to the results obtained by electromyogram measurement of the calf, measurement of a load applied on the sole of a foot, dynamical analysis, etc, the load on the foot in the present embodiment was small by 10 - 20% in
15 body weight ratio as compared with the above-mentioned conventional technique. That is, for a passenger of weight 50kg, the load is reduced by about 5-10kg and, particularly, in the case of a person of old age, it can be contributed to falling prevention.

20 Fig. 4 is a diagram showing measurement result showing relations between take-off distance A from the tip of the comb plate 4 and landing distance B from the tip of the comb plate 4.

According to the measurement results, although there
25 are variations in the measurement values, since a stride of a person is limited, it is found that as the take-off distance A becomes large, a maximum value line of the landing distance B becomes small. Further, in the

measurement results, it is found that when the take-off distance A is made 7 cm or more, the maximum value of the landing distance B becomes short by 15 cm or more as compared with the case where the take-off distance A is 7
5 cm or less.

Therefore, the take-off distance A is desirable to be 7 cm or more, and when the take-off distance is made too large, it is not easy to get on and the distance is limited to 20 cm.

10 Fig. 5 is a diagram showing comparison of landing distance B between the present embodiment in which the take-off mark 6 is provided in a range of 10-20 cm of the take-off distance and the conventional passenger conveyer.

In Fig. 5, the results are obtained by measuring take-
15 off distances of a lot of persons and totaling in the case where the persons get on a usual manner without particularly hurrying. "Maximum - minimum" expresses data of maximum landing distance B and minimum landing distance B of the totaled take-off distances, and "median" expresses
20 a median value of the totaled landing distances B and "25% - 75%" expresses a range of landing distances B between data at 25% and at 75% of the number of data of totaled landing distances B arranged from the minimum to maximum.

According to the totaled results, in the present
25 embodiment, the maximum landing distance B becomes smaller than in the conventional passenger conveyer, and the landing distances B of passengers in the range of 25-75% also become smaller and converges in a range between about

36 cm and 47cm, whereby it is understood that the present embodiment will contribute to falling prevention.

Further, in the present embodiment, explanation is taken so as to provide the take-off mark 6 at a place
5 distant by the take-off distance L, however, the same effect will be attained by constructing a portion from the comb plate 4 to the take-off mark 6 as one continuous take-off mark 6.

Further, in the present embodiment, the same effect
10 also can be attained by applying it in the case of descending operation.

Next, a second embodiment of the present invention will be explained, referring to Figs. 6 to 8.

Fig. 6 is a perspective view showing a construction
15 sectional in part in the vicinity of a way for getting on and off on one side of a passenger conveyer relating to the present embodiment.

In Fig. 6, a reference number 7 denotes a walk timing mark provided on the getting on and off floor 2 at a place
20 distant from the tooth tip 4B of the comb plate 4 by a take-off distance M. The other construction is the same as that with the same reference numbers in Fig. 1, so that explanation thereof is omitted.

For the walk timing mark 7, as in the case of the take-off mark 6, it is better to use rather bright color having
25 Munsell value of 3 or more, really, difference of 5 to 6 in Munsell color system, generally used in coloring of the floor and comb plate 4, so as to easily discriminating the

mark even by a passenger having visual activity having weakened or even in the case where environmental illuminance is dark.

Next, movement of a passenger using the passenger
5 conveyer when in elevating operation is explained, referring to Fig. 2 and Fig. 7.

Here, Fig. 7 is a diagram showing movement of a passenger on the passenger conveyer relating to the present embodiment in the case where the walk timing mark 7 is
10 provided backward the comb plate 4 at a position distant from the tip of the comb plate 4 by a distance M corresponding to a stride of the passenger.

As shown in Fig. 7, since the walk timing mark 7 is provided, when a passenger gets on, he has corrected his
15 stride to be a stride-equivalent distance M at the time of one step before he gets on, and in many cases, once corrected stride is not returned back to the original stride at the time of the next step, so that the passenger takes off in the vicinity of the comb plate 4, and the
20 landing foot steps on a horizontal step 3A1. When the stride after correction is 40 cm, an angle of the landing foot to the body gravity is 16° which is small, and force necessary for the take-off foot to take off is sufficient to be relatively small. According to the measurement of
25 load of the sole of the take-off foot, as compared with that in the conventional passenger conveyer as shown in Fig. 2, the load of the foot was small by about 14% in body weight ratio. That is, for a passenger of 50 kg in weight,

it means that a load of about 7 kg is reduced. Further, according to the measurement of loads beared on muscular power of the calf, as compared with in the conventional passenger conveyer shown in Fig. 2, a load of about 42% is reduced and, particularly, it can contribute to falling prevention of a passenger of old age.

Further, in this example, as the stride-equivalent distant M, 40 cm is taken, however, the same effect also can be attained in a range of 30 - 50 cm. Here, when it is 30 cm or less, walk becomes unnatural, and when it is 50 cm or larger, an effect of correction of a stride becomes less.

Fig. 8 is a graph showing comparison of landing distance B between the present embodiment and the prior art in the case where the walk timing mark is provided on the floor at the position of the stride-equivalent distance M = 40 cm from the tip of the comb plate 4.

In Fig. 8, also the comparison result was obtained by measuring getting on of a lot of passengers and totaling, and "maximum - minimum", "median", and "25% - 75%" have the same meaning as explained in Fig. 5.

According to the totaled results, in the present embodiment, as compared with in the conventional passenger conveyer, the maximum value of the landing distance B becomes small, the landing distances B of the passengers in a range of 25%-75% also becomes small and converge in a range of about 38cm -46cm, and it is understood that it will be contributed to falling prevention when getting on

and off.

Further, a combination of the take-off mark 6 in the first embodiment and the walk timing mark 7 in the second embodiment also can be used. In this case, a multiplier
5 effect of both the marks can be attained, and it is possible to surely cause the landing distance B to enter in a desired range, and it can more surely prevent passengers from being fallen.

As has been explained above, according to the present
10 invention, by using the take-off mark, the walk timing mark or their combination, when a passenger gets on, the passenger can get on a horizontal step before the step takes difference in level by elevation or descending, an increase in load beared by the take-off foot can be
15 reduced, and it can contribute to falling prevention.

WHAT IS CLAIMED IS

1. A passenger conveyer provided with getting on and off floors and a plurality of steps connected to one another to
5 be endless and going in and out of said floors at the forward ends thereof, characterized in that a take-off mark displaying a place of a standing position for a passenger to get on said steps is provided at a position of each of said floors distant by a prescribed distance from said
10 forward end.

2. A passenger conveyer provided with getting on and off floors, a plurality of steps connected to one another to be endless and going in and out of said floors at the forward
15 ends thereof, and comb plates mounted on said floors and having a lot of tooth tips meshed with a lot of concave grooves formed in the surfaces of said steps in a non-contact condition, characterized in that a take-off mark displaying a place of a standing position for a passenger
20 to get on said steps is provided at a position of each of said floors distant by a prescribed distance from said tooth tips of each of said comb plates.

3. A passenger conveyer according to claim 2,
25 characterized in that a take-off distance between said take-off mark and said tooth tips of each of said comb plates is 7 - 20cm.

4. A passenger conveyer according to claim 2,
characterized in that a position from said comb plate to
said take-off mark is displayed as one take-off surface
inclusive of said comb plate, said take-off distance
5 between said tooth tips of said comb plate and said take-
off mark is 20 cm or less.

5. A passenger conveyer provided with getting on and off
floors and a plurality of steps connected to one another to
10 be endless and going in and out of said floors at the
forward ends thereof, characterized in that a walk timing
mark displaying a walk timing position for a passenger to
adjust his stride is provided at a position of said floor
distant by a stride-equivalent distance from said forward
15 end of each of said floors.

6. A passenger conveyer provided with getting on and off
floors, a plurality of steps connected to one another to be
endless and going in and out of said floors at the forward
20 ends thereof, and comb plates mounted on said floors and
having a lot of tooth tips meshed with a lot of concave
grooves formed in the surfaces of said steps in a non-
contact condition, characterized in that
a walk timing mark displaying a walk timing position for a
25 passenger to adjust his stride is provided at a position of
said floor distant by a stride-equivalent distance from
said forward end of each of said floors.

7. A passenger conveyer according to claim 6,
characterized in that a distance between said tooth tips of
said comb plate and said walk timing mark is 0-50 cm.

5 8. A passenger conveyer according to claim 6 or 7,
characterized in that a take-off mark displaying a place of
a standing position for a passenger to get on said steps is
provided at a position of each of said floors distant by a
prescribed distance from said tooth tips of said comb
10 plate.