

PASSENGER CONVEYOR AND TREADBOARD CONSTRUCTION
FOR PASSENGER CONVEYOR

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This invention relates to a passenger conveyor, such as an escalator and an electrically-operated road (moving side-walk), moving in a horizontal or an inclined direction for carrying passengers, and also to a treadboard construction for use in such a passenger conveyor. More particularly, the invention relates to a passenger conveyor driven by a linear motor and to a treadboard construction for such a passenger conveyor.

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Passenger conveyors of the type in which treadboards are driven by a linear motor are known, for example, from U.S. Patent Nos. 3,731,166 and 4,738,346 and Japanese Patent Unexamined Publication Nos. 62-100395 and 62-136489.

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There is also known a technique, for example, from GB 2096966A, in which endless flexible belts such as a moving handrail is driven by a linear motor.

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In the above conventional technique for driving the treadboards by the linear motor, the dimensions of installation of the passenger conveyor have not been taken into consideration, and therefore there has been encountered a problem that the passenger conveyor has an increased size. The purpose of the above conventional technique for driving the endless flexible belts, such as a moving handrail, by the linear motor is different

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from the purpose of the passenger conveyor of the type in which a number of treadboards are connected together in an endless manner, and the dimensions (particularly, the height) of installation of the passenger conveyor utilizing this technique have not been taken into consideration, as is the case with the first-mentioned prior art.

It is an object of this invention to provide a passenger conveyor in which a linear motor can be mounted without increasing the size of the passenger conveyor.

Another object of the invention is to provide a linear motor-driven passenger conveyor which can smoothly move treadboards.

According to one aspect of the present invention, there is provided a passenger conveyor comprising a plurality of treadboards interconnected in an endless manner and being movable along an advance-travel path and a return-travel path disposed below said advance-travel path; and a linear motor for driving said treadboards;

wherein a plurality of stators and moving members which jointly constitute said linear motor are formed in a flattened configuration in a direction of travel of said treadboards and in a direction of the width of said treadboards, and vertically overlies each other separated by a gap therebetween; said stators being disposed between said advance-travel path and said return-travel path; and said moving members being mounted on reverse sides of said treadboards, respectively.

Preferably, a gap-keeping means is provided between each stator of the linear motor and each treadboard to maintain a gap between

1 the stator and each moving member of the linear motor.

Since the stators and the moving members of the linear motor are formed into a flattened configuration, the linear motor can be mounted in a small space
5 between the advance-travel path and the return-travel path of the treadboards. By providing the gap-keeping means, the running resistance concentrating on the treadboards and guide members for them can be dispersed, thereby achieving a smooth movement of the treadboards.

10 In the drawings:

Fig. 1 is a partly-broken, side-elevational view of a passenger conveyor provided in accordance with the present invention;

Fig. 2 is an enlarged, vertical cross-sectional
15 view taken along the line II-II of Fig. 1;

Fig. 3 is an enlarged view of the broken part of Fig. 1;

Fig. 4 is an enlarged, vertical cross-sectional view taken along the line IV-IV of Fig. 1;

20 Fig. 5 is a side-elevational view showing a support construction for stators of a linear motor;

Fig. 6 is a schematic side-elevational view showing a drive mechanism for a moving handrail of the passenger conveyor of the present invention;

25 Fig. 7 is a plan view of the portion shown in Fig. 6;

Fig. 8 is a side-elevational view of another

1 embodiment of the present invention, showing the relation
between treadboards at the advance-travel path and
stators of a linear motor;

Fig. 9 is an enlarged cross-sectional view
5 taken along the line IX-IX of Fig. 8;

Fig. 10 is a view similar to Fig. 9, but
showing a modified form of the invention;

Fig. 11 a side-elevational view showing a
modified treadboard of the invention;

10 Fig. 12 is a view similar to Fig. 8, but
showing a connecting construction for the treadboards;
and

Figs. 13 and 14 are side-elevational views
showing different arrangements of the stators of the
15 linear motor, respectively.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

One preferred embodiment of the invention will
now be described with reference to the drawings. This
embodiment is directed to an electrically-operated road
20 (moving sidewalk) for carrying passengers in a horizontal
direction, and the construction thereof will now be
described. A main frame 1 is formed, for example, by
a combination of angle steel members of an L-shape
cross-section. More specifically, the main frame 1
25 comprises a pair of right and left main frame members
2A and 2B, and horizontal members 3 interconnecting the
right and left main frame members 2A and 2B at a

1 plurality of regions spaced along the length of the
main frame members 2A and 2B. Although not shown in
the drawings, a pair of advance-travel guide rails 4U
and a pair of return-travel guide rails 4D, which guide
5 treadboards 5 (later described), are supported on the
main frame 1. Each of the treadboards 5 comprises a
horizontal tread portion 6 on which the passenger gets,
and reinforcement members 7A and 7B mounted on the
reverse surface of the tread portion 6. The treadboard
10 5 has a height dimension (thickness) h_c . The treadboard
5 has two shafts 8 extending through the pair of rein-
forcement members 7A provided respectively at the
lateral side portions of the treadboard 5. A pair of
rollers 9 are rotatably supported respectively on the
15 opposite ends of each shaft 8. Since the two shafts 8
are provided respectively at the front and rear portions
of the treadboard 5 spaced from each other in the
direction of travel of the treadboard 5, four rollers 9
per treadboard 5 move on and along the advance-travel
20 guide rails 4U or the return-travel guide rails 4D. The
shafts 8 are connected at their opposite end portions
to a pair of endless chains (endless elongated members)
10, so that the treadboards 5 are interconnected in an
endless manner. The treadboards 5 thus interconnected
25 are driven by a linear motor 11. The linear motor 11
is, for example, a linear induction motor which comprises
stators 13 and moving members 12 disposed so as to be
opposed to the stators 13. Although not shown in the

1 drawings, the stator 13 comprises a stator core and
a stator coil wound on the stator core. The linear
motor 11 is driven by a commercial electric power source
or through an inverter. The moving member 12 is
5 composed solely of a non-magnetic conductor such as
aluminum and copper, or is composed of a composite
material having a non-magnetic conductor laminated on
a surface of a magnetic material. A pair of moving
members 12 are fixedly secured directly to the reinforce-
10 ment member 7B, mounted on the reverse side of each
treadboard 5, by conventional means such as bolts and
welding. The pair of moving members 12 (12A and 12B)
are provided respectively at the opposite lateral side
portions of each treadboard 5 in symmetrical relation
15 to each other. On the other hand, the stators 13 are
supported by the horizontal members 3 of the main frame
1 so as to be opposed to the moving members 12a and 12B.
More specifically, the stators 13 (13A and 13B) are
supported on support frames 14, respectively, and each
20 pair of support frames 14 extend between and fixed to
the adjacent horizontal members 3 (Fig. 3). The height
dimension h_a of the stators 13a and 13B, disposed in a
space L between the adjacent horizontal members 3 and
disposed in a space X between an advance-travel path and
25 a return-travel path of the treadboards 5, overlaps the
height dimension h_b of the horizontal members 5 in the
direction of the height. The stators 13a and 13B are
spaced a slight distance g from the moving members 12A

1 and 12B.

The above construction is for the advance travel side of the treadboards 5. As shown in Fig. 4, with respect to the return travel side, the stators 13A and 13B are mounted between the adjacent horizontal members 3 through the support frames 14, and are directed downward so as to face the moving members 12A and 12B fixedly mounted on the reverse side of the treadboards 5.

10 The support frame 14 has a guide edge 14G opposed to the shafts 8, extending through the treadboard 5, with a slight gap δ (Fig. 3), and the guide edges 14G of the support frames 14 limit the attraction of the treadboard 5 toward the stators 13 which would occur as a result of the flexing of the shafts 8 due to magnetic attractive forces M and N developing between the stators 13 and the moving members 12 during the operation of the electrically-operated road. Thus, the guide edges 14G prevent the above magnetic attractive forces from becoming a burden on the rollers 9. The stators 13 (13A and 13B), as well as the moving members 12 (12A and 12B), are so formed and disposed to be flattened in the direction of travel of the treadboards 5 and in the direction of the width of the treadboard 5. The moving members 12, fixedly mounted on the reverse side of the treadboard 5, also serve as reinforcement members for reducing the flexing of the treadboard 5.

Mounting members 15 are fixedly mounted on

1 the upper ends of the pair of right and left main frame
members 2A and 2B, and balustrade panels 16 are fixedly
secured at lower ends thereof to the mounting members
15. A moving handrail 17 moves along the peripheral
5 edge of each balustrade panel 16 at the same speed as
that of the treadboards 15. The lower fixed end portion
of each balustrade panel 16 is covered with an inner
cover 18 and an outer cover 19.

In the electrically-operated road of the above
10 construction, by energizing the stators 13, driving
forces are applied to the moving members 12, so that the
treadboards 5 integrally connected to the moving members
12 move along the advance-travel guide rails 4U and the
return-travel guide rails 4D, thereby conveying the
15 passengers.

The stators 13 and the moving members 12 are
formed into a flattened configuration, and are so arranged
as to overlap each other vertically, and therefore the
stators 13 can be disposed between the advance travel
20 path and the return travel path of the treadboards 5,
and also each pair of mating stators 13 can be disposed
between the adjacent horizontal members 3. As a result,
the distance S (Fig. 2) between the tread portions 6 of
the treadboards 5 disposed respectively at the advance
25 travel path and the return travel path can be made
generally equal to that of a conventional electrically-
operated road. Therefore, in the linear motor-driven
road of this embodiment, the height dimension below

1 the tread portion 6 of the treadboard 5 at the advance
travel path (in other words, the height of the main
frame 1) will not be increased, and therefore the size
of this electrically-operated road is prevented from
5 being increased.

Each pair of mating moving members 12A and 12B
are fixedly mounted respectively at the lateral side
portions of the treadboard 5, and therefore the moments
tending to displace or deform the treadboard 5 about the
10 rollers 9 toward the stators 13A and 13B due to the
magnetic attractive forces by the stators 13A and 13B can
be limited to the minimum. The treadboard 5 can accord-
ingly be reduced in rigidity and hence can be light-
weight.

15 In this embodiment, since the first group
(upper side) of stators 13a and 13B and the second group
(lower side) of the stators 13A and 13B are disposed in
opposed relation to the advance travel path and the
return travel path of the treadboards 5, respectively,
20 the driving forces, as indicated by arrows P and Q in
Fig. 5, can be uniformly applied to the treadboards 5
interconnected in an endless manner. Therefore, the
driving force at the advance travel path of the tread-
boards 5 is balanced with the driving force at the
25 return travel path, and each treadboard 5 can be moved
smoothly. And besides, since the reaction forces F_P
and F_Q acting respectively on the stators 13 at the
advance travel path and the stators 13 at the return

1 travel path are in opposite directions, these reaction
forces FP and FQ cancel each other, so that these
reaction forces will not act on the horizontal members
3 supporting the stators 13. Further, since the pair
5 of chains 10 interconnecting the treadboards 5 in an
endless manner do not need to transmit the driving
force, the chains 10 need only to have a strength of
such a degree as to prevent the adjacent treadboards 5
from moving away from each other.

10 Next, the driving of the moving handrails 17
as well as the braking of the treadboards 5 will now be
described with reference to Figs. 6 and 7. The plurality
of treadboards 5 interconnected by the chains 10 in an
endless manner are guided by a pair of sprockets 21A and
15 21B at each of the entrance and the exit of the electri-
cally-operated road where the path of travel of the
treadboards 5 is inverted. The pair of sprockets 21A
and 21B are fixedly mounted on a rotatable shaft 20
supported on the main frame 1, and the pair of chains
20 10 are extended around the pair of sprockets 21A and
21B, respectively. A pair of drive sprockets 22A and
22B are fixedly mounted on at least one of the two
rotatable shafts 20 (each having the pair of sprockets
21A and 21B fixedly mounted thereon) provided respec-
25 tively at the entrance and the exit of the electrically-
operated road. A pair of transmission chains 23 are
extended around the drive sprockets 22A and 22B, respec-
tively, so as to drive a pair of handrail drive devices

1 24 for driving the pair of moving handrails 17, respec-
tively. For example, the handrail drive device 24
comprises driven rollers 26 for holding the moving
handrail 17 in a proper position, and drive rollers 25
5 for urging the moving handrail 17 against the driven
rollers 26. The drive chain 23 drives the drive rollers
25 for rotation.

A rotary disk 27 is fixedly mounted on the
rotatable shaft 20, and is disposed outwardly of the
10 drive sprocket 22A. A brake device 28 is provided in
opposed relation to the outer peripheral portion of the
rotary disk 27. For example, the brake device 28
comprises a disk brake device designed to hold the
opposite side faces of the rotary disk 27.

15 In the above construction, when the plurality
of treadboards 5 are driven by the linear-motor to be
moved, the chains 10 connected to the treadboards 5 are
moved to rotate the sprockets 21A and 21B, so that the
drive sprockets 22A and 22B on the rotatable shaft 20
20 are rotated. As a result, the transmission chains 23
extended respectively around the drive sprockets 22A and
22B rotate the drive rollers 25 of the respective
handrail drive devices 24, so that the drive rollers
25, together with the driven rollers 26, move the moving
25 handrails 17. When the operation of the electrically-
operated road needs to be stopped, the brake device 28
is operated to brake or stop the rotatry disk 27. By
the braking of the rotary disk 27, the treadboards 5 are

1 stopped through the rotatable shaft 20, the sprockets
21A and 21B and the chains 10.

In the above embodiment, the treadboards 5
provided with the moving members 12 are moved by the
5 stators 13 of the linear motor, and the adjacent tread-
boards 5 are spaced such a gap from each other as not
to interfere with one another. Therefore, as shown in
Fig. 8, when the treadboards 5D, 5F and 5R are moving
in a direction of an arrow, the treadboards 5D receiving
10 the driving force from the stators 13 push the treadboard
5F, already passed past this stator 13, with a reduced
gap G between the treadboards 5D, and also pull the
treadboard 5F, not yet reaching the stators 13, through
the chains 10. This pushing and pulling are carried out
15 each time the treadboards pass past the stators 13, and
therefore particularly when the treadboards 5D receiving
the driving force push the treadboard 5F already passed
past the stators 13, a sound due to collision is
produced. Thus, noises are always produced.

20 In view of the above, a spacer 29 is formed
on at least one of the opposed ends of the adjacent
treadboards 5D, 5F, 5R so as to keep the gap G between
the adjacent treadboards generally constant, thereby
decreasing the change of the gap G. If the change of
25 the gap G between the adjacent treadboards 5 is
eliminated, the collision will not occur, so that the
collision sound will not be produced. In this case, by
forming the spacer 29 by an elastic material such as

1 rubber or a spring, the spacer 29 can have a cushioning
function. In Fig. 8, the spacer 29 is formed on the
leading or front end A of one of the adjacent treadboards
5D, and is opposed to the trailing or rear end B of the
5 other treadboard 5D. However, the spacers 29 may be
provided respectively on the opposed leading and trailing
ends A and B of the treadboards, or the spacers 29 may
be provided respectively on the leading and trailing
ends of one treadboard 5d in which case any spacer 29
10 is not provided on the treadboards disposed forwardly
and rearwardly adjacent respectively to this treadboard
5D.

As shown in Fig. 2, the treadboards 5 (5D, 5F,
5R) are moved along the advance-travel guide rails 4U
15 through the rollers 9 mounted on the opposite ends of
the shafts 8 extending through the treadboards. However,
when the electromagnetic attractive force is exerted on
the stators 13 during the operation of the linear motor,
the treadboard 5 tends to be displaced downward through
20 the moving members 12. In order to limit such displace-
ment to a small level, it can be considered to make the
shafts 8 thick; however, even if the shafts 8 are made
thick, a large load acts on bearings (not shown) for
the rollers 9 which bearings are mounted on the end
25 portions of the shafts 8. In addition, in the case
where a rubber tire is mounted on the outer periphery
of each roller 9 so as to reduce noises, the rubber tire
may be compressed to reduce the gap between the opposed

1 moving member 12 and the stator 13. An undue compression
of the rubber tire shortens the lifetime of the rubber
tire, and when the gap between the stator 13 and the
moving member 12 is reduced, they may be brought into
5 contact with each other, and besides the driving force
is changed to prevent a smooth movement of the tread-
boards.

Therefore, as shown in Figs. 8 and 9, gap-
keeping members 30A and 30B for keeping the gap g between
10 the opposed surfaces of the stator 13 and the moving
member 12 constant are provided on that surface of the
stator 13 opposed to the moving member 12, the gap-
keeping members 30A and 30B being spaced from each other
in the direction of travel of the treadboards 5. The
15 gap-keeping members 30A and 30B are made of a sliding
material.

With this construction, even when the electro-
magnetic attractive force acts between the moving member
12 and the stator 13, the gap g therebetween can be
20 kept generally constant by the gap-keeping members 30A
and 30B. Therefore, there is no need to make the shafts
8 of the rollers 9 thick, and in the case where the
rubber tire is mounted on each roller 9, the rubber tire
is not excessively compressed. Further, since the gap
25 g is kept constant, the driving force produced by the
linear motor is generally uniform. Incidentally, in
the case where the rubber tire is mounted on each roller
9, a gap corresponding to the amount of compression of

1 the rubber tires at the time when passengers get on the
electrically-operated road is preferably beforehand
provided between the gap-keeping members 30A and 30B and
the moving member 12. This eliminates the disadvantage
5 that the gap-keeping members 30A and 30B bear the overall
weight of the treadboard.

The gap-keeping members 30A and 30B are the
sliding members which are made of a non-magnetic material
having a low coefficient of friction and a wear-
10 resistance. However, since the gap-keeping members 30A
and 30B are in contact with the moving member 12, the
generation of the sliding resistance and sliding noises
can not be avoided. Therefore, as shown in Fig. 10,
non-magnetic rotary members 31 are projected from the
15 moving member 12 (provided on the reverse side of the
treadboard 5D) toward the stator 13. Thanks to the
rotary members 31, the above-mentioned sliding resist-
ance and sliding noises are eliminated. The amount of
projection of the rotary member 31 from the moving member
20 12 is determined in view of the gap g between the moving
member 12 and the stator 13.

Although the above description has been
directed to the electrically-operated road movable in
the horizontal direction, this construction can be, of
25 course, applied to an electrically-operated road disposed
in an inclined direction.

The present invention also can be applied to
an escalator inclined at an angle of around 30° . Fig.

1 11 shows a treadboard 32 for such an escalator. The
treadboard 32 comprises a tread portion 33 on which the
passenger gets, a pair of reinforcement frames 34 of
a generally triangular shape respectively supporting
5 the lateral side portions of the tread portion 33, a
riser 35 extending downward from the rear end of the
tread portion 33 and supported on the reinforcement
frames 34, and front rollers 36 and rear rollers 37
rotatably supported by shafts supported respectively
10 on the front and rear ends of the reinforcement frames
34 at the lower sides of the reinforcement frames 34.
The treadboard 32 moves along a pair of guide rails 38
through the front and rear rollers 36 and 37. Although
not shown in the drawings, the treadboard 32 is connected
15 to its adjacent treadboard 32A through endless chains
to which the shafts for the rollers 36 and 37 are
supported, as described above for the electrically-
operated road of the preceding embodiment. A moving
member 39 of a linear motor is mounted on the lower
20 surface of each of the pair of reinforcement frames 34
through support members 40, the moving member 39 being
disposed between the pair of shafts for the front and
rear rollers 36 and 37. The moving member 39 is formed
into a flattened configuration in the direction of
25 movement of the treadboard 32 and also in the direction
of the width of the treadboard 32. Stators (not shown)
of the linear motor provided so as to be opposed to
the moving members 39 are arranged in the same manner

1 as described above for the stators of the electrically-
operated road of the preceding embodiment. In order to
prevent a collision between the adjacent treadboards 32
and 32A during the operation of the linear motor,
5 spacers 41 are mounted respectively on the front or
leading ends of the reinforcement frames 34, and are
projected to be opposed to a lower end 35S of the riser
of the treadboard 32A. Since the reinforcement frames
34 are provided at the inner side of the riser lower end
10 35S, the riser lower end 35S will not be deformed when
the spacers 41 collide therewith.

In each of the above embodiments, the tread-
boards 5 (5D, 5F, 5R), 33 are interconnected by the
chains 10 in an endless manner. Therefore, when the
15 driving force acts on the rear-side treadboard, the
chains can be easily loosened, so that the rear-side
treadboard collides with the front-side treadboard. To
prevent this, it is necessary to provide the spacers
29, 41. Fig. 12 shows a construction of interconnecting
20 the treadboards in which the need for the spacers 29,
41 is obviated. More specifically, adjacent treadboards
5 are interconnected by connecting members 42. The
connecting member 42 is made of a rigid material, and is
pivotally connected at its opposite ends to the rein-
25 forcement members 7A of the adjacent treadboards 5 by
pins 43 and 44. With this connecting construction, when
the left-side treadboard 5 is driven to move in a
direction of an arrow in Fig. 12, the right-side

1 treadboard 5 is pushed through the connecting members
42, so that the gap G between the two treadboards 5 is
not changed. Therefore, the collision between the two
treadboards 5 will not occur, and noises and damage to
5 the treadboards 5 which would otherwise be caused by
the collision will not be produced.

Next, reference is now made to Figs. 13 and
14. In Fig. 13, an upper row of stators 13 of the linear
motor are arranged in opposed relation to the advance-
10 travel path of the treadboards 5, and a lower row of
stators 13 are arranged in opposed relation to the
return-travel path of the treadboards 5. When the
passenger conveyor is crowded with passengers, all the
stators 13 are energized to operate the passenger
15 conveyor; however, when no passenger or a small number
of passengers get on the passenger conveyor, the stator
13G at the terminal end of the advance-travel path of
the treadboards 5 is energized either alone or in combi-
nation with the stator 13R at the start point of the
20 return-travel path. By operating the passenger conveyor
in this manner, all the treadboards at the advance-travel
path are pulled for movement, and therefore can be moved
smoothly. However, when the stator at the start point
of the advance-travel path and the stator at the terminal
25 end of the return-travel path are energized, all the
treadboards at the advance-travel path are pushed.
Therefore, in the case where the treadboards are inter-
connected by the chains, there is a possibility that

1 the chains are loosened, so that the treadboards are
lifted from the guide rails. Therefore, this is not
advisable.

In Fig. 14, all the stators 13 of the linear
5 motor are arranged in opposed relation to the advance-
travel path of the treadboards 5. By energizing all the
stators 13, most of the treadboards 5 at the advance-
travel path can always obtain the driving force, and
therefore the treadboards can stably travel with the
10 passengers thereon.

As described above, in the present invention,
the stators and the moving members which jointly consti-
tute the linear motor are flattened in the direction
of travel of the treadboards and in the direction of the
15 width of the treadboard, and the stators and the moving
members are provided between the advance-travel path
and return-travel path of the treadboards. With this
construction, the linear motor can be mounted without
increasing the size of the passenger conveyor.

20 Further, by providing the gap-keeping means
between the stator and the moving member of the linear
motor and by providing the spacer between the adjacent
treadboards, the treadboards can be moved smoothly.



CLAIMS

1. A passenger conveyor comprising a plurality of treadboards interconnected in an endless manner and being movable along an advance-travel path and a
5 return-travel path disposed below said advance-travel path; and a linear motor for driving said treadboards; wherein a plurality of stators and moving members which jointly constitute said linear motor are formed in a flattened configuration in a direction of travel of said treadboards and in a direction of the
10 width of said treadboards, and vertically overlies each other separated by a gap therebetween; said stators being disposed between said advance-travel path and said return-travel path; and said moving members being
15 mounted on reverse sides of said treadboards, respectively.
2. A passenger conveyor according to claim 1 in which said treadboards are guided by right and left advance-travel rails and right and left return-travel
20 rails; said stators being mounted between said right and left advance-travel rails and said right and left return-travel rails.
3. A passenger conveyor according to claim 1 or claim 2 in which said plurality of treadboards and said
25 linear motor are supported by a main frame and said stators are disposed between said advance-travel path



and said return-travel path and also between adjacent horizontal members which constitute said main frame.

4. A passenger conveyor according to claim 3, in which said stator is disposed in such a manner that said stator overlaps said horizontal member in a direction of the height of said passenger conveyor.

5. A passenger conveyor according to any one of claims 1, 2 and 3, in which said stators are arranged in parallel to the direction of movement of said treadboards.

6. A passenger conveyor according to any one of claims 1, 2 and 3 in which stators of said linear motor are disposed between said advance-travel path and said return travel path, and moving members of said linear motor are mounted so that said moving members can be vertically opposed to said stators, and gap-keeping means is provided between said stator and said moving members to maintain a gap therebetween.

7. A passenger conveyor according to claim 6, in which said gap-keeping means is provided on said moving members and projects toward said stator.

8. A passenger conveyor according to claim 6, in which said gap-keeping means is provided on said stator and projects toward said moving members.

9. A passenger conveyor according to claim 7 or claim 8, in which said gap-keeping means has a



rotatable member at its projecting end.

10. A passenger conveyor according to any one of claims 7, 8 and 9 in which said gap-keeping means is made of a non-magnetic material.

5 11. A passenger conveyor according to any one of claims 1 to 10, in which said stators face said moving members at said advance-travel path of said treadboards and at said return-travel path of said treadboards.

10 12. A passenger conveyor according to claim 11, in which stators facing the advance-travel path and stators facing the return-travel path are alternately arranged in the direction of travel of said treadboards.

15 13. A passenger conveyor according to any one of claims 1 to 12, in which there is provided a rotary member driven by the movement of said treadboards and moving handrails on the sides of said treadboards along a direction of movement, said moving handrails being driven by the rotation of said rotary member.

20 14. A passenger conveyor according to claim 13 in which there is provided a brake device for applying a braking force to said rotary member.

25 15. A passenger conveyor according to any one of claims 1 to 12, in which there is provided a first rotary member driven by the movement of said treadboards, second and third rotary members which are



driven by the rotation of said first rotary member, and moving handrails provided on the sides of said treadboards along a direction of movement; said moving handrails being driven by the rotation of said second rotary member; and there being provided a brake device for applying a braking force to said rotary member.

5 16. A passenger conveyor according to claim 15, in which said first rotary member acts as a guide for guiding the inversion of said treadboards between said
10 advance-travel path and said return-travel path.

17. A passenger conveyor according to claim 1, in which said treadboards, respectively, are supported by a pair of right and left endless elongated members; and said treadboards being provided with a spacer for
15 maintaining a gap between said adjacent treadboards.

18. A treadboard construction according to claim 17, in which said spacer has a cushioning function.

19. A passenger conveyor according to any one of claims 1 to 18, in which said treadboards are formed
20 such that the surfaces of said treadboards opposed to said stators which constitute said linear motor are formed in a horizontal direction and that magnetic flux of said stators intersect said surfaces of said treadboards vertically.

25 20. A passenger conveyor according to any one of claims 1 to 19, in which said treadboards have a



mounting portion which rotatably mounts thereto connecting means for interconnecting adjacent treadboards.

21. A method of operating a passenger conveyor
5 comprising a plurality of treadboards interconnected in an endless manner to form an advance-travel path and a return travel path disposed below the advance-travel path, and a linear motor for driving said treadboards said linear motor being jointly constituted by stators
10 and moving members which are formed into a flattened configuration in a direction of travel of said treadboards and in a direction of the width of said treadboards and vertically overlies each other separated by a gap therebetween, said moving members being
15 provided on said treadboards,

wherein the stators of said linear motor are selectively driven in accordance with the condition of the operation of said passenger conveyor.

22. A method according to claim 21, in which the
20 selective driving of the linear motor is such that one of said plurality of stators which is disposed in opposed relation to the downstream end of the advance-travel path is always energized during the operation of said passenger conveyor.

25 23. A passenger conveyor substantially as herein described with reference to and as shown in Figs. 1 to



7 or modified as shown in Figs. 8 and 9, Fig. 10, Fig. 12, Fig. 13 or Fig. 14 of the accompanying drawings.

24. A treadboard for a passenger conveyor substantially as any herein described with reference to
5 and as shown in the accompanying drawings.

25. A method of operating a passenger conveyor driven by a linear motor, substantially as herein described with reference to the accompanying drawings.
