



DUPLICATE

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ESCALATOR APPARATUS

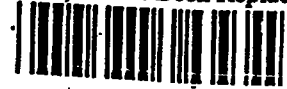
The present invention relates to an escalator apparatus, and more particularly to an escalator  
5 apparatus suitable for mounting and carrying a vehicle such as a wheelchair, electric cart or a handcart.

In the past, an escalator apparatus capable of mounting and carrying a wheelchair has been described in, for example, Japanese Patent Application Laid-Open  
10 No. 60-23285 (1985). However this apparatus has a disadvantage in that the kinds of wheelchairs to be mounted are limited since the surface for mounting a wheelchair is not able to be utilized as much as possible.

15 An object of the present invention is to provide an escalator apparatus on which the kinds of wheelchairs to be mounted are not limited or less limited, by utilizing the surface for mounting a wheelchair as much as possible.

20 Another object of the present invention is to provide an escalator apparatus which is capable of stably and safely carrying a wheelchair.

The present invention in one aspect provides an escalator apparatus having a specified group of steps  
25 which form a wheelchair mounting surface when it is desired to carry a wheelchair, which comprises a retractable wheel-stop moving in its projection movement from the edge portion at the lower floor side



of said wheelchair mounting surface obliquely upward and toward the lower floor side, the top end portion of said wheel-stop moving during its projection movement on a locus bringing it toward the upper floor side.

5           The locus of the top or outer end of the wheel-stop may thus be a curve which increases in steepness towards the projecting end portion of the wheel-stop movement, i.e. is concave towards the upper floor side of the escalator.

10           In the construction described above, since a wheel-stop projects from the lower floor side edge portion of the wheelchair mounting surface obliquely upward and toward the lower floor side, the wheelchair mounting surface can be utilized by placing the wheel  
15 of a wheelchair near the projecting portion of the wheel-stop, and is therefore capable of mounting a large sized electric driven wheelchair. Further, since the direction of movement of the top end of the diagonally projected wheel-stop is changed, during  
20 projection, toward the wheel, the top end of the wheel-stop can contact a higher portion of the wheel.

Therefore, the wheelchair can be stably carried since the wheelchair cannot fall unless it moves over the high wheel-stop. Furthermore, since the wheel-stop is  
25 moved toward the wheel after it is initially projected, the wheel-stop cannot easily contact to the wheel of the wheelchair during projecting or withdrawing of the



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wheel-stop, which leads to smooth riding and handling of a wheelchair.

Embodiments of the invention are described below by way of non-limitative example with reference to the  
5 accompanying drawings, in which:-

Fig. 1 is a partially cross-sectional side view showing one embodiment of an escalator apparatus in accordance with the present invention carrying an electric driven cart.

10 Fig. 2 is an enlarged side view showing the wheel-stop in the escalator apparatus of Fig. 1.

Fig. 3 is a schematic side view showing the entire structure of the escalator apparatus of Figs. 1 and 2.

15 Fig. 4 is a perspective view showing one form of wheel-stop of an escalator apparatus in accordance with the present invention.

Fig. 5 is a partial enlarged front view of the portion P in Fig. 4.

20 Fig. 6 is a front view showing the relation between an electric driven cart and the wheel stop of one escalator apparatus in accordance with the present invention.

Fig. 7 is a view corresponding to Fig. 2 of  
25 another wheel-stop of an escalator apparatus in accordance with the present invention.

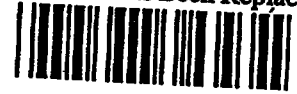


Fig. 8 is an enlarged side view showing another embodiment of a wheel-stop in an escalator apparatus in accordance with the present invention.

Fig. 9 is an enlarged side view showing a  
5 further embodiment of a wheel-stop in an escalator apparatus in accordance with the present invention.

Fig. 10 is an enlarged side view showing another embodiment of a wheel-stop in an escalator apparatus in accordance with the present invention.

10 Fig. 11 is an enlarged side view showing another embodiment of a wheel-stop in an escalator apparatus in accordance with the present invention.

One embodiment of an escalator apparatus 18 capable of mounting an electric driven wheelchair  
15 according to the present invention will be described, referring to Figs. 1 to 3. The escalator apparatus is the same as a normal escalator in that it comprises a plurality of steps 1 connected to each other in an endless loop with a chain (not shown), a pair, right  
20 and left, of balustrade panels 2 provided on both sides of the steps 1 along the moving direction of the steps, and handrails 3 supported and guided on the peripheries of the balustrade panels 2 and driven synchronously with said steps 1. The escalator has an upper landing  
25 4U portion (at the upper floor side) and a lower landing portion (at the lower floor side) and is installed for example between upper and lower floors of a building.



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The escalator in this embodiment is constructed to have a specified group of steps 5 among the plurality of steps 1 adapted to carry an electric driven cart 18. That is, the specified group of steps 5 are three adjacent steps among the steps 1. The uppermost step among the specified group of steps is called a base step 6, the next lower step being called a middle step 7, the lowest step being called a lower step. Step treads 7F and 8F of the middle step 7 and the lower step 8 can be raised up to the level of the step tread 6F of the base step 6 to form a wheelchair mounting surface by establishing a common horizontal level of the specified group of steps 5.

The construction and the operation of the specified group of steps 5 will be described in detail below.

The base step 6 in the specified group of steps 5 has a fixed step tread 6F, while the middle step 7 and the lower step 8 have step treads 7F and 8F each of which moves upward and downward. Each of the steps has front wheels and rear wheels guided by guide rails 17A and 17B for guiding all the steps, which are secured to a main frame, that is, a fixed member of the escalator. The step treads 6F, 7F and 8F are connected by connecting devices 9, 10A and 10B to form a common horizontal surface during the time of carrying a wheelchair. The step treads 7F, 8F are supported on base frames 7B, 8B having the front wheels and rear



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wheels through parallel links 11, 12A and 12B. The parallel links 12A and 12B in the lower step 8 are constructed to form a two stage structure of a first parallel link 12A and a second parallel link 12B

5 interposing a middle base frame 8M. In addition, a wheel-stop 13 is mounted under the reverse side of the step tread 8F of the lower step 8.

The wheel-stop 13 is arc-shaped, the center of the arc  $O_1$  being located towards the upper floor side and lower relative to the shaft center  $O_2$  of a wheel shaft 19R in an electric driven cart 18 to be mounted. A hole 8H provided in the step tread 8F is closed by the top end portion 13A of the arc-shaped wheel-stop and the rear end portion 13B of the wheel-stop is  
15 located in a position near the reverse side surface of the step tread 8F, during normal operation of the escalator. The hole 8H is provided at the edge end portion in the lower floor side of the step tread 8F and extends obliquely upward and toward the lower floor  
20 side. The top end portion 13A moves out from the rear side surface of the step tread 8F during the time of carrying a wheelchair, and is withdrawn into the reverse side of the step tread 8F at the time of returning to normal operation. The wheel-stop 13 is  
25 contained in the longitudinal direction of the step tread 8F of the lower step 8, that is, in the longitudinal direction of the wheelchair mounting



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surface, the top end portion 13A closing the hole 8H, the concave side of the wheel-stop facing upward.

The mechanism to project and withdraw the wheel-stop 13 will now be described. A rack 14 is formed on the convex side of the arc and non-projecting side of the wheel-stop 13, and gears 15A and 15B to engage with the rack are mounted at a position on the reverse side of the step tread 8F. The wheel-stop 13 is driven in the direction of the arrow a or the arrow b by rotating the gears 15A and 15B appropriately. The gears 15A and 15B are driven by a driving mechanism (not shown) installed on the lower step 8 or in the main frame of the escalator only when the specified group of steps 5 is on the upper landing portion 4U or on the lower landing portion 4D. Guiding rollers 16 are provided to maintain the engagement of the rack 14 and the gear 15A and to restrict the moving direction of the wheel-stop 13.

The operation of the wheel-stop 13 constructed as above will be described below. For example, when a person in charge 21 is called by a user 20 riding on an electric driven cart 18 who wants to ride upward on the escalator, the person in charge 21 switches the escalator from a normal operation to a wheelchair carrying operation. On this switching, the specified group of steps 5 is stopped or driven with an extremely slow speed for stand-by at the front of the lower landing portion 4D in a state in which the upper step

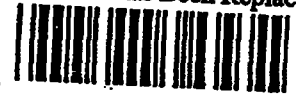


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6, the middle step 7 and the lower step 8 are at a common horizontal level. In this state, the person in charge 21 guides the cart 18 to a suitable position on the specified group of steps 5 and brakes the cart 18.

5 Then the person in charge 21 pushes a start button to accelerate the escalator. On this occasion, the gears 15A and 15B are rotated with receiving the driving power of the driving unit contained inside the lower step 8 or the driving unit installed in the main frame  
10 of the escalator, the wheel-stop 13 forming a one-piece structure with the rack 14 engaging with the gears thus being moved out in the direction of the arrow a in Fig. 2 to project from the surface of the step tread 8F. The wheel-stop projection is performed while the  
15 specified group of steps 5 is running on the horizontal section of the escalator, and after completion of projection the wheel-stop 13 is fixed with a locking mechanism (not shown) so as not easily to be withdrawn. As described above, the rear wheel 19R of the electric  
20 cart 18 is thus stopped to prevent the cart from backward running on the specified group of steps 5 by the wheel-stop 13 and the front wheel 19F is stopped by the riser 1R of the step 1 just before the specified group of steps 5, having been raised to carry the cart  
25 without risk of forward running.

When the base step 6 positioned in the upper portion of the specified group of steps 5 enters into the inclined section of the escalator, the step treads



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7F and 8F of the middle step 7 and the lower step 8  
connected by the connecting devices 9 and 10A are  
raised as the upper step 6 moves upward in such a  
manner that the step treads 7F and 8F keep a horizontal  
5 level together with the step tread 6F of the upper step  
6. In the inclined section, the three step treads 6F,  
7F and 8F are thus kept as a horizontal surface to  
carry the electric driven cart 18 (Fig. 1).

Incidentally, concerning the operation of the  
10 connecting devices 9, 10A and 10B and the parallel  
links 11, 12A and 12B it is recommended to refer to the  
specification of Japanese Patent Application No. 3-  
195224 (Effective Filing Date of August 5, 1991).

As the specified group of steps, after passing  
15 through the incline section of the escalator, approach  
the upper landing portion 4U and enter the upper  
horizontal section, the parallel links 11, 12A and 12B  
in the step treads 7F, 8F of the middle step 7 and the  
lower step 8 are folded to be contained in the base  
20 frames 7B and 8B, respectively, since the step  
differences in the steps 6, 7 and 8 disappear. While  
the specified group of steps 5 is stopped or driven  
with an extremely slow speed, the person in charge 21  
releases the brake in the cart and guides the cart 18  
25 to the landing floor of the upper landing portion 4U.  
After the cart 18 leaves the escalator, the person in  
charge pushes a reset button to return the escalator to  
normal operation. Then the escalator is re-started,



concurrently the gears 15A and 15B are rotated by the driving unit contained inside the lower step 8 or a driving unit installed in the main frame of the escalator, the wheel-stop 13 forming a one-piece structure with the rack 14 engaging with the gears being moved in the direction of the arrow b to be withdrawn into the reverse side of the step tread 8F. At the same time, the connections of steps 6, 7 and 8 are released.

10           Although the description above has been of a case where a cart 18 is carried from a lower floor in a building to the upper floor, the reverse procedure may be followed when the cart is carried from an upper floor to the lower floor.

15           In the embodiment above, the wheel-stop 13 is arc-shaped and arranged so that the concave side of the wheel-stop is directed upward and the wheel-stop is projected and withdrawn from a portion on the step tread 8F of the lower step 8 near the riser 8R side obliquely toward the lower floor side. Therefore, even when the wheel 19F or 19R of the cart 18 is placed near the hole 8H for the wheel-stop 13, the wheel does not interfere in the projecting or withdrawing operation of the wheel-stop 13 and the dimension for mounting of the wheelchair in the travelling direction can be utilized at a maximum. Further, even in a case where the wheel-stop is projected with a rather small angle against the step tread 8F, the wheel-stop can engage the wheel at a



higher position comparing to the tilting angle of the hole since the wheel-stop 13 is arc-shaped and the top end portion 13A of the wheel-stop 13 is projected along the arc. Therefore, the wheel-stop has an excellent  
5 safety function.

Furthermore, since the step tread 8F is constructed to be capable of moving upward and downward, and is lifted up to a high level, various kinds of driving mechanisms or power transmission  
10 mechanisms having complex structures are installed inside the step. Therefore, it is impossible to use a wide space for containing the wheel stop and for the driving mechanisms. However, in the embodiment, the wheel-stop is arc-shaped and the rear end portion of  
15 the wheel-stop is located near the reverse side of the step tread 8F when the wheel-stop is withdrawn. Therefore, the configuration of the other mechanisms are not much limited since the wheel-step and its related unit are arranged in a position near the  
20 reverse side of the step tread 8F.

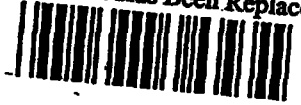
It can be conceived that the wheel-stop 13 is straight-shaped and is projected from and withdrawn to the step tread 8F with a small angle. In a case where a straight-shaped wheel-stop is simply projected from  
25 and withdrawn 8F with a small angle, the projected length must be lengthened in order to contact a cart wheel at the same level as with the arc-shaped wheel-stop 13. However, since a wheel-stop having such a



long length cannot be contained inside a single step, it is difficult to provide it for practical use. In order to compromise this, the tilting angle of the wheel-stop is increased to contact the cart wheel at a higher level, the position of withdrawal of the wheel-stop 13 reaches the central portion of the step 8 and it becomes impossible to instal it together with the other mechanisms. On the other hand, when the projected length is shortened, the wheel-stop can be contained. However, since the level of the wheel-stop is lowered, the risk of a wheel passing over it by accident increases. Thus, the wheel-stop formed in an arc-shape and being tangentially projected is best.

The reason why the wheel-stop 13 is formed in an arc-shape is that the top end portion 13A of the wheel-stop 13 gradually changes its moving direction toward the wheel, and projects in such a manner the wheel-stop in effect grasps the wheel. The wheel-stop 13 does not touch and strike the wheel when a cart rides on the escalator, and the projecting and withdrawing operation of the wheel-stop can be smoothly performed.

In the above embodiment, when the wheel-stop 13 stops a four-wheeled wheelchair or handcart, a pair of wheel-stops may be provided in the width direction, right and left, of the step tread 8F corresponding to the wheels in right and left. In order to include the case of a three-wheeled electric driven cart, as shown in Fig. 4 to Fig. 6, it is necessary that the width  $W_1$



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of the wheel-stop is somewhat larger than the transverse width  $W_2$  of the wheelbase of the cart. The width of the step tread is  $W$ . By employing the wheel-stop 13 of this type having the width of  $W_1$ , the single  
5 wheel in the front of the cart is contacted at the central portion in the width direction of the wheel-stop 13 to stop the cart when the three-wheeled electric driven cart is carried from the upper floor to the lower floor.

10 As shown in Fig. 5, the wheel-stop 13 having the width of  $W_1$  may be formed in a comb-shape, and constructed such that each tooth portion 13T of the wheel-stop is projected and withdrawn through a hole 8H formed in each bottom between cleats 8K on the step  
15 tread 8F. The rack 14 and a rolling surface 13G for a guiding roller 16 are formed on the base portion 13M of the comb.

Fig. 7 shows an arc-shaped wheel-stop 13 having buffers 22 at two points on the wheel-stop, one being  
20 at a position such that the top end portion 13A of the wheel-stop is kept to close the hole 8H when the wheel-stop is completely withdrawn, the other being at a position so as to determine that the top end portion 13A of the wheel-stop 13 is at maximum projection from  
25 the step tread 8F. In this embodiment, one buffer 22 is provided at the rear end 13B of the wheel-stop 13, and the other is provided at a position on the wheel-stop near the step tread 8F when the top end portion



13A of the wheel-stop 13 is at maximum projection from the step tread 8F. Corresponding stops 25 are provided in positions on the reverse side of the step tread 8F opposed to these buffers, respectively. The buffer 22  
5 comprises a projection 23 and a coil spring 24 pressing the projection 23. The buffers 22 can absorb the impact noise and moderate the impact force generated when the wheel-stop 13 collides against the stop 25 to be stopped.

10 Fig. 8 shows an arc-shaped wheel-stop 13 having a guiding and driving mechanism of another construction. A guide member 26 extends parallel with the arc-shaped wheel-stop 13 except at the portion of the wheel-stop which projects from the surface of the step tread.  
15 Guiding rollers 16 and 27 on four sides guide the guide member to move along the desired arc. A rack member 28 is provided on the guide member 26 and is engaged with a gear 29 driven with a power source installed separately. This construction is useful when the wheel-stop 13 has a  
20 long width as shown in Fig. 4 and when the wheel-stop 13 has a long width as shown in Fig. 4 and when the wheel-stop 13 is formed in a one-piece structure through joining wheel-stop parts of comb-tooth-shape.

Although in the embodiments described above the  
25 wheel-stop 13 is formed in an arc shape having a single center, a wheel-stop of other than arc-shaped may be employed, provided that the top end of a wheel-stop can be moved without touching the wheel of a cart during



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projection of the wheel-stop and can stop the wheel at a final position. A wheel-stop, for example, having an involute-shape or having a moving locus of involute may be usable. Fig. 9 shows an embodiment of a wheel-stop 5 30 having a straight shape. The top end portion 31 of the wheel-stop has a shape so as to close a hole 8H provided on a step tread 8F in the retracted position. A guide roller 33 is provided on the rear end portion 32 of the wheel stop. It is sufficient that the length 10 between the top end portion 31 and the rear end portion 32 is a little longer than that of the projected portion of the wheel-stop. The guide roller 33 on the rear end portion 32 is guided by a straight guide rail 34 extending toward the riser 8R and provided in the 15 reverse side of the step tread. Further, a direction changing roller 35 contacting the reverse side of the top end portion 31 is provided near the hole 8H.

In order to project the wheel-stop 30 in the above construction, the guide roller 33 is pushed in the 20 arrow direction using a driving unit installed inside or an external power unit. On pushing of the guide roller 33, the moving direction of the wheel-stop 30 is varied by the roller 35, the top end portion 31 moving from the point (1) via the point (2) to the point (3) along a curved 25 locus, finally to touch the cart rear wheel 19. Thus, the tilting angle  $\theta_2$  against the step tread 8F at completion of projection of the wheel-stop 30 is larger than the tilting angle  $\theta_1$  against the step tread 8F at



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the beginning of projection of the wheel-stop 30. As described above, since the top end portion of the wheel-stop 30 can be moved without touching the wheel 19<sup>1</sup> of a cart during projection of the wheel-stop and can stop the wheel at a high position, the effect thereof is the same as in the embodiments described above.

Although in the embodiment just described above the direction of movement of the wheel-stop 30 is varied by the direction changing roller 35 concurrently with the projection of the wheel-stop, its direction of movement does not need to be varied continuously. The structure shown in Fig. 10 is almost the same as shown in Fig. 9, but the difference is that the shape of the guiding rail 36 guiding the guided roller 33 on the rear end of the wheel-stop 30 differs. That is, the guiding rail 36 has two guiding sections, a straight first guiding section  $L_1$  projecting the wheel-stop in a straight direction and a second guiding section  $L_2$  varying the direction of end of the wheel-stop 30 towards the wheel 19. In the first guiding section  $L_1$ , the top end portion 31 of the wheel-stop 30 is moved straight from the position (1) to the point (2). In the second guiding section  $L_2$ , the top end portion 31 of the wheel-stop 30 is moved on a curved locus from the position (2) to the point (3). Therefore, the top end portion of the wheel-stop 30 can be moved without touching the wheel 19 of a cart during projection of the



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wheel-stop and the embodiment also has the effect that the wheel-stop can stop the wheel at a high position.

The structure shown in Fig. 11, where the wheel-stop 37 is vertically mounted along the riser 8R, is basically the same as those shown in Fig. 9 and Fig. 10. That is, the guide roller 33 provided on the rear end portion 39 of the vertically contained wheel-stop 37 is pushed up while being guided by the guiding rail 40 having a bend-shape. The top end portion 38 of the wheel-stop 37 normally closes the hole 8H on the step tread 8F, but is moved upward as illustrated by the two-dot chain lines and finally touches the wheel 19. In order to attain the moving locus of the wheel-stop 37, a pair of rollers 35 and 35B are provided close to the hole 8H to guide the wheel-stop. In this embodiment, the top end portion of the wheel-stop 37 also can be moved without touching the wheel 19 of a cart during projecting the wheel-stop and the embodiment has the effect that the wheel-stop can stop the wheel at a high position.

Although each of the embodiments has been described for the case of carrying an electric driven cart, it is obvious that the escalator apparatus can be used to carry a hand wheelchair, an electric driven wheelchair, a handcart and so on, and when carrying these, the operation of the escalator apparatus is the same as described above.



CLAIMS

1. An escalator apparatus having a specified group of steps which form a wheelchair mounting surface when it is desired to carry a wheelchair, which comprises a retractable wheel-stop moving in its projection movement from the edge portion at the lower floor side of said wheelchair mounting surface obliquely upward and toward the lower floor side, the top end portion of said wheel-stop moving during its projection movement on a locus bringing it toward the upper floor side.

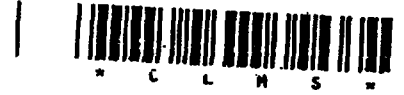
2. An escalator apparatus according to claim 1, wherein said wheel-stop when retracted is located at the reverse side of said wheelchair mounting surface and extends longitudinally along said wheelchair mounting surface.

3. An escalator apparatus according to claim 1, wherein said wheel-stop when retracted is located along the riser at the lower floor side edge portion of said wheelchair mounting surface.

4. An escalator apparatus having a specified group of steps which form a wheelchair mounting surface when it is desired to carry a wheelchair, which comprises a retractable wheel-stop, the top end portion of said wheel-stop in its projection movement moving from the edge portion at the lower floor side of said wheelchair

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mounting surface obliquely upward and toward the lower floor side and changing its direction of movement toward the upper floor side.

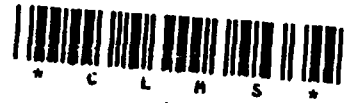
5. An escalator apparatus having a specified group of steps which form a wheelchair mounting surface when it is desired to carry a wheelchair, which comprises a curved retractable wheel-stop, the top end of which closes an aperture in said wheelchair mounting surface when retracted and the rear end of which is positioned near the reverse side surface of said wheelchair mounting surface when retracted, said wheel-stop being moved from the edge portion at the lower floor side of said wheelchair mounting surface obliquely upward and toward the lower floor side, for carrying of a wheelchair.

6. An escalator apparatus according to claim 5, wherein said curved wheel-stop has an arc-shape.

7. An escalator apparatus according to claim 6, wherein the arc center of said arc-shaped wheel-stop is lower than the axis of the maximum diameter wheel of a wheelchair to be mounted.

8. An escalator apparatus according to claim 6 or claim 7, wherein said arc-shaped wheel-stop is contained in the lowermost step of said specified group of steps.





9. An escalator apparatus having a specified group of steps which form a wheelchair mounting surface when it is desired to carry a wheelchair, which comprises a projection and withdrawing mechanism for mounting a retractable wheel-stop near the reverse side surface of said wheelchair mounting surface, and adapted to project the top end portion of said wheel-stop from the edge portion at the lower floor side of said wheelchair mounting surface obliquely upward and toward the lower floor side at the time of carrying a wheelchair, and to displace the top end of the projected wheel-stop toward the upper floor side.

10. An escalator apparatus having a specified group of steps which form a wheelchair mounting surface when it is desired to carry a wheelchair, which comprises a projecting and drawing mechanism for mounting a retractable wheel-stop below said wheelchair mounting surface, and adapted to project the top end portion of said wheel-stop from the edge portion of the lower floor side of said wheelchair mounting surface obliquely upward and toward the lower floor side at the time of carrying a wheelchair and to displace the top end of the projected wheel-stop toward the upper floor side.

11. An escalator apparatus having a specified group of steps which form a wheelchair mounting surface when it is desired to carry a wheelchair, which comprises a retractable wheel-stop which is projected from the edge





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portion at the lower floor side of said wheelchair mounting surface obliquely upward and toward the lower floor side at the time of carrying a wheelchair, the tilting angle of the wheel-stop at the uppermost  
5 projecting position relative to the wheelchair mounting surface being larger than its tilting angle relative to the wheelchair mounting surface in the retracted position.

10 12. An escalator apparatus having a specified group of steps which form a wheelchair mounting surface when it is desired to carry a wheelchair, which comprises a retractable wheel-stop which is projected from the edge portion at the lower floor side of said wheelchair  
15 mounting surface obliquely upward and toward the lower floor side at the time of carrying a wheelchair, and a guiding mechanism for gradually increasing the tilting angle of the wheel-stop relative to the wheelchair mounting surface as the projected length of the wheel-  
20 stop is increased.

13. An escalator apparatus which forms a wheelchair mounting surface by horizontally supporting three steps at the same level during the carrying of a wheelchair,  
25 which comprises a wheel-stop member curved concavely upward, projectable from the edge portion at the lower floor side of the normally lowermost step among said

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three steps obliquely upward and toward the lower floor side.

14. An escalator apparatus according to claim 13,  
5 wherein the width of said wheel-stop is greater than at least the maximum transverse wheelbase of a wheelchair to be mounted.

15. An escalator apparatus according to claim 13 or  
10 claim 14, wherein the center of said wheel-stop in the width direction is positioned at the center of width of said wheelchair mounting surface.

16. An escalator apparatus having a specified group  
15 of steps which form a wheelchair mounting surface when it is desired to carry a wheelchair, which comprises a retractable wheel-stop contained below a step tread during normal operation, and being projected from the step tread obliquely upward at the time of carrying a  
20 wheelchair, the top end portion of the wheel-stop moving on an involute locus.

17. An escalator apparatus substantially as any of  
those herein described with reference to and as shown in  
25 the accompanying drawings.

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