

Description

This invention relates to a moving beltway for use by pedestrians or for the movement of goods and is particularly applicable, but not restricted, to moving beltways which have sections running at different speeds.

Previous moving beltways have suffered certain disadvantages.

If they are to be a constant speed beltway the surface has either been very heavy belting or metal treads located on a carrier frame and each of these are inherently expensive and also provide mechanical problems in siting, in that when they are to return they need a substantial diameter roller, as the radius about which they can turn is large. This may involve the building of a pit or the like at each end of the beltway to receive the rollers.

A further major problem with moving beltways, quite generally but particularly if they are to be of variable speed or are long has been the translation of the user between a stationary position and the beltway and between adjacent parts of a beltway. This latter aspect has been considered most serious for two reasons. Firstly such transitions are normally required to be effected where the beltway is one which has a variable speed and thus the transition is occurring at a higher absolute speed than is the case with moving onto or off a standard beltway moving at a slow speed.

This means that whilst the relative speed between the two adjacent sections of beltway are relatively small, the belts or the like comprising the surfaces of the beltway are both travelling at relatively high speeds adjacent to the surrounding ground or wall defining the sides of the beltway.

Thus, should, for example, a user fall or an article attached to a person, such as part of a shoe or a trailing portion of a garment or the like be caught between the belt or the plate or comb at the transition then the likelihood of injury is substantially greater than would be the case if the same accident occurred on a slower speed beltway section.

There have been proposed ways in which to attempt to overcome these problems, but they have not been satisfactory and have not been commercially adopted.

They include the use of transfer plate sections which are movable in a plane normal to the beltways and the concept of short lengths of narrow belts which overlap in the direction of movement thereof, and belts which are at different levels so that a user has to physically step from one belt upwardly or downwardly to the next adjacent belt. Also where the belts are ribbed, which has normally been the case, the transfer area must include combs, and where the belts are heavy and are

passing over relatively large diameter rollers, it has been practically, extremely difficult if not impossible to maintain accurate narrow spacings between the combs and the belt when the belt is travelling at a high speed.

In FR-A-2395176, there is disclosed a beltway system for the transport of standing passengers over substantial distances comprised of at least one beltway section which has two spaced small diameter rollers which define the ends of the section, drive means, and a thin flexible continuous slider belt which is adapted to pass over the rollers defining the ends of the section and to be driven by the drive means. This prior system uses a series of elastomeric belts to provide an acceleration or deceleration gradient. The belts are ribbed and a metallic transition section is interposed between the adjacent ends of adjacent belts and, at each end, the transition section is toothed to form a comb the teeth of which engage between the ribs of the adjacent belt at the same level. The transition section is relatively short in an attempt to facilitate transfer of passengers from one belt to the other, but the possibility still remains of part of a shoe or a trailing portion of a garment from being caught between the end of the first belt and the leading edge portion of the transition section.

An objective of the present invention is to provide a beltway system in which the aforesaid problems are minimised and which can be used either as a constant speed or variable speed beltway. More particularly an objective of the invention is to provide a safe transition between two beltway sections or between a beltway section and any other adjacent part of the system such as an end plate or transfer plate whereby any part of a passenger or his or her clothing or accoutrements on the beltway cannot be caught on or by part of the beltway or its components.

To achieve these objectives, the present invention is characterised in that the belt is flat, the delivery end of the belt terminates close to an adjacent part of the system which is at a level beneath the level of the upper surface of the belt, with the width between the upper run of the belt and the adjacent part of the system being such that the footwear of even the smallest standing child passenger travelling from the delivery end of the belt to the adjacent part is in contact with the adjacent part before losing contact with the belt, and the speed of the belt in relation to the radius defined by the belt as it passes over the roller and the spacing between the belt and the adjacent part being such that a body leaving the delivery end of the belt and travelling substantially at the speed of the belt and falling under gravity is delivered to the adjacent part sufficiently far beyond the point of closest juxtaposition to ensure a successful auto-

matic transfer of the body onto the adjacent part, without the possibility of any part of the body being in a position from whence it can be drawn into the space between the belt and the adjacent part.

At each end of a horizontal length of belt there can be a plate having an inner edge formed to closely abut the belt as it passes around the roller at the beginning or end of its run, the upper surface of the plate being smooth to facilitate easy transition thereacross and the spacing between the edge of the plate and the upper surface of the belt being small, generally less than 1.0 mm, to prevent articles passing therebetween.

The beltway can comprise a number of adjacent belt sections each of which closely abut the next adjacent section and this is essential where the beltway is to be one on which the speed varies along the length. In such an arrangement the beltway can also have a long "central" section which operates at a constant speed and which has shorter beltway sections adjacent each end thereof.

In one aspect of this, a junction between two beltway sections is provided by a transfer plate between the two sections. In a specific arrangement the surface of the transfer plate is curved downwardly so that the edge of the transfer plate which is adjacent the end of the delivery belt section is at a lower level than the central portion of the transfer plate.

In an alternative arrangement which is suitable for relatively low speed beltways we use ribbed belts for some portions of the beltway and the combs used with these belts are so formed as to have longitudinal members which are narrower than and shallower than the spacing between the ribs of the belt running the length of the belt between two transfer plates.

This arrangement means that a person wearing a normal shoe, or any reasonable sized body, is supported by the ribs of the belt but any narrower body such as, for example a woman's spike heel which can fit between the belt ribs can rest on the longitudinal member between adjacent ribs but will slide along this member. As a person's shoe is transferred from one belt to the next the heel will be automatically carried onto the transfer plate and subsequently onto the next belt section.

The longitudinal member may be rods or bars.

Such an arrangement is preferably only used on the lower speed portions of the beltway as they are not necessary for the higher speed portions.

In this specification, the term "standing passenger" refers to a passenger standing with both feet stationary on the belt.

In order that the invention may be more readily understood, reference will be made to the accompanying drawings in which:

Figure 1 is a schematic view of part of a beltway of the invention;

Figure 2 is a side sectional elevation of one of the modules of the beltway;

Figure 3 is an enlarged view showing the arrangement at the junction between two modules; Figure 4 is a view similar to Figure 3 but showing a modified form of transfer plate;

Figure 5 is a schematic view showing the relationship between a ribbed belt having rods in the ribs and a higher speed belt using a transfer plate similar to that of Figure 4; and Figure 6 is a sectional view along line 6-6 of Figure 5.

The specifically illustrated embodiment shows an arrangement which is for a beltway having variations in speed along its length but, as will be described hereinafter, the invention also relates to a constant speed beltway.

The beltway can be deemed to be made up of a number of independent modules 2 and these modules may be individually replaceable so that should there be a fault in any particular module it can readily be removed and replaced thus limiting the down time of the beltway.

Referring specifically to Figure 1, there are a number of modules 2 each of which has a roller 15 at each end thereof and a belt 20 passing thereover.

For convenience, where required, and when referring to adjacent beltway sections, we shall use the term delivery and receiving to indicate the appropriate section.

The belt 20 passes beneath a pair of idler rollers 25 and is driven by a driver roller 31a. The or one of the idler rollers 25 may be adjustable to enable the belt 20 to be tensioned.

It will be seen from the schematic in Figure 1, that the top runs of the belts 20 normally lie in the same plane and can as better be seen from Figures 2 and 3 because the overall spacing between the belts 20 is only minimal.

If changes in grade are required, the planes of the top runs of the belts can be at angles to each other.

The first or last sequence of belts in a system would be relatively short, the upper run could be of the order of 300 to 1000 mm. The belts 20 can be relatively thin and this permits the belts to pass over pulleys of a very small diameter. For example the diameter of the pulleys 15 could be of the order of 30 to 70 mm.

This means that the effective space between the adjacent portions of the upper run is only of the order of 20 to 40 mm which is substantially less than the length of a user's shoe, even if the user has only a very small foot, such as a child. The under-surface of the upper run of the belt is supported on a slider plate 26.

Located between each pair of modules there is a plate 10 which has an upper surface 11, which may be polished which provides a low friction surface for the footwear of a user of the beltway so that if the user is standing on the beltway with his or her feet substantially parallel to the direction of movement of the beltway then they will be transferred from one module to the other with no difficulty whatsoever.

As can be seen specifically from Figure 3 the edge 14 of the plate 10 is adapted to closely approach the thin belt 20 as it passes over the small diameter roller 15.

The tolerance of the thickness of the belt is controlled so that the spacing between the periphery of the roller 15 and the edge 14 of the plate 10 defines a passage which is only slightly greater in width than the thickness of the belt so that as the belt passes under or leaves from the outer edge of the plate 10 the spacing between that edge and the belt 20 is very small so articles can not be drawn therein.

It is preferred that the tolerance is such that a flowing piece of material, such as a belt or the hem of a coat or a dress cannot readily pass therebetween.

It is also preferred that there is a sensor associated with the junction so that if anything should enter the spacing, the belts are stopped.

Adjacent to the free end of the highest speed module 2 there is a long belt 27 which can provide the central part of the beltway.

Although not fully illustrated, it is preferred that the drive rollers 31a are all driven from the same power source or that the power sources be centrally controlled so that if there is any failure in the drive this effects all of the modules equally and at the same time, so that there can be no inherent difficulty which could occur if a person is moved from a moving module to a stationary module.

The pulleys or gearing between the modules and the drives can be different diameters so that there can, over the length of the beltway, be a gradual increase in speed from an initial speed which is acceptable to a passenger entering a beltway, for example between 0.4 to 0.9 metres per second up to a speed which could be as high as 3.5 metres per second, and then a reduction in speed through a number of modules to an exit speed of, again, 0.4 to 0.9 metres per second.

The sequence of short belts operate so that each belt travels somewhat faster or slower than its neighbours. In this way the passengers on the beltway are speeded up on the acceleration section at the start of an installation, and slowed down at the end of it. By the time the passengers reach the long central section of constant speed belting, their spacing is increased above the entrance spacing

by the ratio of the speed of the constant speed belt to the speed of the first belt. The belt is therefore subjected to a lesser loading than it would have had if it was the only belt in the installation, and it does not have to contend with the acceleration forces of the smaller belts. In these circumstances it is possible to use a thin slider belt for the constant speed section which is capable of being returned about a 30 to 70 mm diameter roller, as are the short belts and can therefore be brought within 20 to 40 mm of the last accelerating or the first decelerating belt from which it will be separated by the plate 10 which is the same as the plates between the modules.

The length of run of the constant speed belt will be determined by its vertical profile, its relative speed and the space available for the drive motor.

Larger passenger runs can be achieved by providing adjacent slider belts separated by plates 10 and which run at the same speed.

Changes of grade may be effected by introducing one or more sections of short belt, providing belts tangential to the theoretical sag curve between a horizontal belt, and a belt with a positive incline, each belt passing around smaller rollers 15 and separated by plates 10. Over summit changes of grade the vertical profile of the slider plate can guide the long thin belt.

In the foregoing we describe arrangements, basically by using thin belts that can pass over narrow rollers, whereby the spacing between two adjacent belt sections in a moving beltway can be limited and, in these arrangements, we have described relatively narrow transfer plates which have a smooth upper surface over which portions of the shoes or other articles associated with a user and in contact with the belt can pass as there is transition from belt to belt.

It will be appreciated that there are practical difficulties in providing tolerances between the belt and the transfer plates which are so fine that it is not possible for an article, say such as a thin piece of dress material to pass between these if the flexible material is pressed against the opening by a solid object which by its weight eliminates the irregularities in the material which is abutting the opening and, of course, if such can occur then injury could be caused to the user. One method of avoiding or minimising this difficulty is the provision of sensors as previously described.

We have calculated that this problem can be greatly reduced by locating the transfer plate below the level of the belts and by forming the upper surface of the transfer plate.

The transfer plates have a width of the order of 30mm and on almost all occasions a user will transfer across the plate with the heel of the shoe, or even part of the sole of the shoe remaining on

the delivery belt until after the leading edge of the shoe is received on the receiving belt and thus there will only be minimal contact, if any, with the transfer plate.

In accordance with this aspect of the invention and as illustrated in Figure 4, which contains dimension solely for exemplification, we physically locate the surface of the transfer plate below the level of the belts 51, which can have a thickness of approximately 3mm and we have found by calculation that provided that this spacing is of the order of 3mm if the belts are moving at a speed of even 0.6 m/sec then it is effectively impossible for any part of the user or any solid article carried by the user to contact the gap between the transfer plate and the belt.

As can be seen from Figure 4 the horizontal distance from the tangent point of the belt to the point at which the belt comes into close abutment to the edge 14 of the transfer plate 50 is 12 mm. At a belt speed of 0.6 metres/sec it will take a body some 15mm in forward movement before it will drop 3mm in vertical movement and thus any body leaving the belt will not strike the transfer plate 50 until it passes the gap.

This however is very much at the lower end of the speed to which the invention relates.

If the belt is travelling at 0.9 metres/sec then the distance travelled before dropping 3 mm is 23 mm and if at 1.2 metres/sec, which is the lower order of speed we would anticipate from the fastest belt then the distance travelled would be 30mm. These distances are derived using a vertical acceleration of 1g which would usually be the downward acceleration of a solid body and some consideration must be given to the situation as far as an elastic body is concerned.

At the somewhat higher speeds it can be shown that for a body to approach the gap between the edge 14 of the transfer plate and the belt there would need to be a downward acceleration of approximately 3 gs.

An elastic body, such as a balled up or compressed piece of fabric could accelerate at more than one g but normally this would tend to expand to a rest position with the overall acceleration in any direction being substantially less than 3 gs.

Also it will be appreciated that any article which is so accelerating will tend to be folded or bunched so it is unlikely that there would be a clean edge portion which would pass between the belt and the edge 14 of the transfer plate, unless the article was pressed upon by a solid object.

Whilst in the foregoing embodiment we have not described the actual surface of the transfer plate it would be possible to provide a profiled transfer plate of the type illustrated in Figure 4 which would operate in the same way as described

but which would, minimize, apparent change in level for a person passing thereover.

In a variation of the profile the edge of the plate abutting the preceding belt may be shaped to further lower the position of the belt/transfer plate edge abutment so that there is additional room for elastic material to unfold. Solid objects will bridge the gap and contact the central portion of the transfer plate which is higher than the edge portions.

We could also provide an additional means which would act to prevent any entrance of material into the gap between the belt and the transfer plate.

This would be by providing a relatively powerful air draft passing upwardly from beneath the upper run of the belt and through the spaces between the belts and the edges of the transfer plates.

This air blast would of course act to prevent any light elastic object from approaching the gap whilst it would have no effect on solid objects.

Where the belt way is operating at a high speed, and depending upon the spacing between the belts it would be possible to omit the transfer plate completely.

A solid object would travel across the gap without making any contact and an elastic object would be unlikely to make contact, for reasons set out hereinbefore.

Even if an elastic object closely approached the belt surfaces it is most unlikely that it could be ingested as at the junction the two belts are moving in opposite directions and as the object is carried forwardly across the gap it would contact the belt which was moving in a direction away from the gap.

These, apparently, minor modifications greatly increase the safety of a moving beltway which separates individual belts by stationary plates, as it makes the transfer safe and effectively removes any likelihood of injury due to parts of a person's clothing or any other thing from entering the gap between the edge of the transfer plate and the belt.

These aspects of the invention are less applicable at lower speeds where a solid object such as a child's body or a shoe could, falling under 1g of acceleration, so closely follow the elastic material that it could press the material against the slot and result in ingestion of the material. This prospect is increased at the end of the system where a body may come to rest over the transfer plate.

While we believe that such an occurrence will be so infrequent that the sensor triggered system shut-down will prevent more than slight scuffing some National Codes may require an alternative solution using ribs and combs.

At such junctions, therefore, different means may be required to ensure that articles are not gathered between the edges of the transfer plate. One particular way of ensuring safety at lower speeds is to use a modification of ribbed belts, which are often used in beltways.

Ribbed belts are, at each end, normally associated with combs which enter the recesses between the ribs and, hopefully, deflect any article which is resting on the belt over their top surface onto the transfer plate, or to the stationary area adjacent the end of the belt.

These are generally satisfactory but there have been many occasions where articles attached to persons have been caught on the comb or between the belt and the comb and persons can be injured in this way. Broken combs are common and when broken present a greater entrapment potential.

In a further aspect of the invention, which is described illustratively in Figure 5 we effectively extend the teeth of the combs along the whole length of the belt between two adjacent combs.

These extensions can be in the form of rods or bars 60 which have a width less than the spacing between adjacent ribs 61 and a height less than the height of the ribs so that they actually lie below the surface of the belt 62.

It will be appreciated that these rods 60 have a certain degree of flexibility but provided they are made of such material as chrome plated steel or the like they will not provide a strong frictional resistance where contacted by the belt and, also where there is an article resting on them they will act as a slider plate.

Under normal circumstances if there is a user standing on the belt then there will be no contact with the rods as the width of any part of a normal shoe is wider than the spacing between a pair of ribs.

There may however be circumstances where there are narrower articles which can fit between two adjacent ribs and one of these would be the heel of a spike heeled shoe or possibly something such as the edge of an article such as a brief case.

In such a case the article could rest on the upper surface of the rod and slide therealong but when it reaches a transfer plate it will automatically be moved directly onto the transfer plate and cannot pass between the transfer plate and the belt.

It will be seen that possibly the most desirable arrangement for a high speed beltway would be to have the initial or, say the first two or three belts with ribs having rods located between the ribs, the central portions of the beltway using flat belts with transfer plates between belts and below the level of the belt and the terminal portion or portions being ribbed and having rods located between the ribs, generally as illustrated in Fig. 5.

In an extreme case the highest speed transfers could be effected without transfer plates.

This would ensure safety both at the low speed portion of the beltway as well as at the high speed portions.

Where belts which can pass around a very small radius are used it may be that the ends of the sections can be defined by a radiused end of a slider plate and the belts can pass over these radiused ends

Normally the belt would pass through slightly more than the angle necessary to be normal to the upper run, so that the belts of adjacent sections diverge slightly then normally pass around a roller which may define the commencement of the lower run.

Claims

1. A beltway system for the transport of standing passengers over substantial distances comprised of at least one beltway section (2) which has two spaced small diameter rollers (15) which define the ends of the section, drive means (31a) and a thin flexible continuous slider belt (20) which is adapted to pass over the rollers (15) defining the ends of the section and to be driven by the drive means, characterised in that the belt is flat, the delivery end of the belt terminates close to an adjacent part of the system which is at a level beneath the level of the upper surface of the belt with the width between the upper run of the belt (20) and the adjacent part of the system being such that the footwear of even the smallest standing child passenger travelling from the delivery end of the belt to the adjacent part is in contact with the adjacent part before losing contact with the belt, and the speed of the belt in relation to the radius defined by the belt as it passes over the roller (15) and the spacing between the belt and the adjacent part being such that a body leaving the delivery end of the belt and travelling substantially at the speed of the belt and falling under gravity is delivered to the adjacent part sufficiently far beyond the point of closest juxtaposition to ensure a successful automatic transfer of the body onto the adjacent part, without the possibility of any part of the body being in a position from whence it can be drawn into the space between the belt and the adjacent part.
2. A system as claimed in claim 1, wherein the adjacent part is the entry end of a second belt (20).



At such junctions, therefore, different means may be required to ensure that articles are not gathered between the edges of the transfer plate. One particular way of ensuring safety at lower speeds is to use a modification of ribbed belts, which are often used in beltways.

Ribbed belts are, at each end, normally associated with combs which enter the recesses between the ribs and, hopefully, deflect any article which is resting on the belt over their top surface onto the transfer plate, or to the stationary area adjacent the end of the belt.

These are generally satisfactory but there have been many occasions where articles attached to persons have been caught on the comb or between the belt and the comb and persons can be injured in this way. Broken combs are common and when broken present a greater entrapment potential.

In a further aspect of the invention, which is described illustratively in Figure 5 we effectively extend the teeth of the combs along the whole length of the belt between two adjacent combs.

These extensions can be in the form of rods or bars 60 which have a width less than the spacing between adjacent ribs 61 and a height less than the height of the ribs so that they actually lie below the surface of the belt 62.

It will be appreciated that these rods 60 have a certain degree of flexibility but provided they are made of such material as chrome plated steel or the like they will not provide a strong frictional resistance where contacted by the belt and, also where there is an article resting on them they will act as a slider plate.

Under normal circumstances if there is a user standing on the belt then there will be no contact with the rods as the width of any part of a normal shoe is wider than the spacing between a pair of ribs.

There may however be circumstances where there are narrower articles which can fit between two adjacent ribs and one of these would be the heel of a spike heeled shoe or possibly something such as the edge of an article such as a brief case.

In such a case the article could rest on the upper surface of the rod and slide therealong but when it reaches a transfer plate it will automatically be moved directly onto the transfer plate and cannot pass between the transfer plate and the belt.

It will be seen that possibly the most desirable arrangement for a high speed beltway would be to have the initial or, say the first two or three belts with ribs having rods located between the ribs, the central portions of the beltway using flat belts with transfer plates between belts and below the level of the belt and the terminal portion or portions being ribbed and having rods located between the ribs, generally as illustrated in Fig. 5.

In an extreme case the highest speed transfers could be effected without transfer plates.

This would ensure safety both at the low speed portion of the beltway as well as at the high speed portions.

Where belts which can pass around a very small radius are used it may be that the ends of the sections can be defined by a radiused end of a slider plate and the belts can pass over these radiused ends.

Normally the belt would pass through slightly more than the angle necessary to be normal to the upper run, so that the belts of adjacent sections diverge slightly then normally pass around a roller which may define the commencement of the lower run.

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2. A system as claimed in claim 1, wherein the adjacent part is the entry end of a second belt (20).



3. A system as claimed in claim 1, wherein the adjacent part is a transfer plate (10) located between the first belt (20) and a belt of a second beltway section of the system, the two belts being so closely spaced that the footwear of the smallest standing child passenger travelling from the delivery end of the first belt to the entry end of the second belt is in contact with the second belt before losing contact with the first belt.
4. A system as claimed in claim 1, wherein the adjacent part is an end plate at the delivery end of the beltway.
5. A system as claimed in claim 2, wherein the second belt (20) is a thin flat flexible continuous slider belt returning about small diameter rollers (15), the adjacent parts of the two belts being so closely spaced that the width between the adjacent upper runs of the two belts is such that the footwear of even the smallest standing child passenger travelling from the delivery end of the first belt to the receiving end of the second belt is in contact with the second belt before losing contact with the first belt, and the arrangement being such that no part of the passenger's footwear contacts anything at or below the general level of the surface of the belts that is not part of one of the belts.
6. A system as claimed in claim 3, wherein the transfer plate (10) is disposed between adjacent beltway sections of the system and extending across the width thereof, the transfer plate having a smooth upper surface (11) and being formed to terminate at each edge thereof so closely to the belt of the adjacent section as to restrict the entrance of a body between the transfer plate and the belt and at a level so as to provide a smooth transition from the belt of the first section to the belt of the second section, the transfer plate being located, at least on the side adjacent the delivery end of the first section, below the general level of the surface of the belt thereof, the spacing of the transfer plate below the general level of the surface of the belt (20) being such that a body moving from the delivery end of the belt and falling under gravity cannot strike the transfer plate until it has passed the junction between the belt and the transfer plate.
7. A system as claimed in claim 3 or claim 6, wherein the transfer plate (10) has a vertical extension descending between the belts in order to provide rigidity to the transfer plate

necessary to resist deformation when the weight of the passengers pass thereover.

8. A system as claimed in any one of claims 3, 6 or 7, wherein the upper surface (11a) of the transfer plate is curved.
9. A system as claimed in any preceding claim comprising adjacent beltway sections operating at different speeds to accelerate or decelerate passengers travelling thereon.
10. A system as claimed in claim 9, wherein a highest speed section of the system is a single thin flexible long slider belt (27) capable of returning about a roller with a diameter of less than 70 mm.
11. A system as claimed in claim 9, wherein a highest speed section of the system consists of at least two thin flexible long slider belts (27) each capable of returning about rollers with a diameter of less than 70 mm and the junctions between the two belts are as claimed in either claim 5 or claim 6.
12. A system as claimed in any one of the preceding claims including a further beltway section co-linear with the first beltway section, said further section including a ribbed belt (62), a transfer plate being located between the first beltway section and the further section, the further section including a comb (60) extending along the ribbed belt, said comb including teeth comprising longitudinal members which are narrower and shallower than the spacing between the ribs of the ribbed belt and which extend the length of the ribbed belt from the further transfer plate to another transfer plate located adjacent the other end of the ribbed belt.

Patentansprüche

1. Förderbandsystem für die Beförderung von stehenden Passagieren über beträchtliche Strecken mit mindestens einer Förderbandsektion (2), die zwei beabstandete Rollen (15) mit kleinem Durchmesser aufweist, die die Enden der Sektion bilden, Antriebseinrichtungen (31a) und einem dünnen flexiblen kontinuierlichen Gleitband (20), das die die Enden der Sektion bildenden Rollen (15) passieren und von den Antriebseinrichtungen angetrieben werden kann, dadurch gekennzeichnet, daß das Band flach ist, daß das Abgabende des Bandes eng benachbart zu einem benachbarten Teil des Systems endet, der ein Niveau



unterhalb des Niveaus der oberen Fläche des Bandes besitzt, wobei die Breite zwischen dem oberen Trum des Bandes (20) und dem benachbarten Teil des Systems so groß ist, daß sich die Schuhe selbst des kleinsten stehenden Kindes, das sich vom Abgabeende des Bandes bis zum benachbarten Teil bewegt, in Kontakt mit dem benachbarten Teil befinden, bevor der Kontakt mit dem Band verloren wird, und daß die Geschwindigkeit des Bandes im Verhältnis zu dem vom Band gebildeten Krümmungsradius, wenn dieses die Rolle (15) passiert, und dem Abstand zwischen dem Band und dem benachbarten Teil so groß ist, daß ein das Abgabeende des Bandes verlassender Körper, der sich im wesentlichen mit der Geschwindigkeit des Bandes bewegt und durch Schwerkrafteinwirkung fällt, auf den benachbarten Teil ausreichend weit über den Punkt der engsten Anlage hinaus geführt wird, um eine erfolgreiche automatische Überführung des Körpers auf den benachbarten Teil sicherzustellen, ohne daß irgendein Teil des Körpers in eine Position gelangt, aus der er in den Raum zwischen dem Band und dem benachbarten Teil hineingezogen werden kann.

2. System nach Anspruch 1, bei dem der benachbarte Teil das Eintrittsende eines zweiten Bandes (20) ist.

3. System nach Anspruch 1, bei dem der benachbarte Teil eine Überführungsplatte (10) ist, die zwischen dem ersten Band (20) und einem Band einer zweiten Förderbandsektion des Systems angeordnet ist, wobei die beiden Bänder derart eng beabstandet sind, daß sich die Schuhe des kleinsten stehenden Kindes, das sich vom Abgabeende des ersten Bandes zum Eintrittsende des zweiten Bandes bewegt, in Kontakt mit dem zweiten Band befinden, bevor sie den Kontakt mit dem ersten Band verlieren.

4. System nach Anspruch 1, bei dem der benachbarte Teil eine Endplatte am Abgabeende des Förderbandes ist.

5. System nach Anspruch 2, bei dem das zweite Band (20) ein dünnes flaches flexibles kontinuierliches Gleitband ist, das um Rollen (15) mit kleinem Durchmesser zurückgeführt wird, die benachbarten Teile der zwei Bänder so eng beabstandet sind, daß die Breite zwischen den benachbarten oberen Trum der zwei Bänder so groß ist, daß sich die Schuhe selbst des kleinsten stehenden Kindes, das sich vom Abgabeende des ersten Bandes zum Aufnahmeende des zweiten Bandes bewegt, in Kontakt

mit dem zweiten Band befinden, bevor sie den Kontakt mit dem ersten Band verlieren, und die Anordnung derart ist, daß kein Teil der Schuhe eines Passagiers mit irgendetwas auf oder unter dem allgemeinen Niveau der Oberfläche der Bänder in Kontakt tritt, das keinen Teil von einem der Bänder bildet.

6. System nach Anspruch 3, bei dem die Überführungsplatte (10) zwischen benachbarten Förderbandsektionen des Systems angeordnet ist und sich über die Breite desselben erstreckt, die Überführungsplatte eine glatte obere Fläche (11) besitzt und so ausgebildet ist, daß sie an jedem Rand so eng benachbart zum Band der benachbarten Sektion endet, daß das Eindringen eines Körpers zwischen die Überführungsplatte und das Band verhindert wird, und auf einem Niveau, daß ein glatter Übergang vom Band der ersten Sektion zum Band der zweiten Sektion gebildet wird, und die Überführungsplatte mindestens auf der Seite benachbart zum Abgabeende der ersten Sektion unter dem allgemeinen Niveau der Oberfläche des Bandes derselben angeordnet ist, wobei der Abstand von der Überführungsplatte unter dem allgemeinen Niveau der Oberfläche des Bandes (20) derart ist, daß ein sich vom Abgabeende des Bandes aus bewegendes und unter Schwerkrafteinwirkung fallendes Körper nicht auf die Überführungsplatte aufschlagen kann, bis er die Verbindungsstelle zwischen dem Band und der Überführungsplatte passiert hat.

7. System nach Anspruch 3 oder 6, bei dem die Überführungsplatte (10) eine Vertikallänge zwischen den Bändern nach unten besitzt, die der Überführungsplatte die erforderliche Steifigkeit verleiht, um eine Verformung derselben zu verhindern, wenn sich das Gewicht der Passagiere hierüber bewegt.

8. System nach einem der Ansprüche 3, 6 oder 7, bei dem die obere Fläche (11a) der Überführungsplatte gekrümmt ist.

9. System nach einem der vorangehenden Ansprüche, das benachbarte Förderbandsektionen aufweist, die sich mit unterschiedlichen Geschwindigkeiten bewegen, um sich hierauf bewegendes Passagiere zu beschleunigen oder zu verzögern.

10. System nach Anspruch 9, bei dem die Sektion des Systems mit höchster Geschwindigkeit ein einziges dünnes flexibles langes Gleitband (27) ist, das um eine Rolle mit einem Durchmesser



von weniger als 70 mm rückführbar ist.

11. System nach Anspruch 9, bei dem die Sektion des Systems mit höchster Geschwindigkeit aus mindestens zwei dünnen flexiblen langen Gleitbändern (27) besteht, die jeweils um Rollen mit einem Durchmesser von weniger als 70 mm rückführbar sind, und bei dem die Verbindungen zwischen den beiden Bändern so ausgebildet sind, wie sie entweder im Anspruch 5 oder im Anspruch 6 beschrieben sind.

12. System nach einem der vorangehenden Ansprüche mit einer weiteren Förderbandsektion, die kollinear zur ersten Förderbandsektion angeordnet ist und ein Rippenband (62) aufweist, wobei eine Überführungsplatte zwischen der ersten Förderbandsektion und der weiteren Sektion angeordnet ist und die weitere Sektion ein sich entlang dem Rippenband erstreckendes Kammelement (60) aufweist, das Längselemente aufweisende Zähne besitzt, die schmaler und flacher sind als der Abstand zwischen den Rippen des Rippenbandes und die sich über die Länge des Rippenbandes von der weiteren Überführungsplatte zu einer anderen Überführungsplatte erstrecken, die benachbart zum anderen Ende des Rippenbandes angeordnet ist.

Revendications

1. Ensemble à tapis roulant pour le transport de passagers debout, sur des distances importantes, comprenant au moins un tronçon (2) de tapis roulant ayant deux rouleaux distants (15) de petit diamètre qui délimitent les extrémités du tronçon, un dispositif d'entraînement (31a) et une mince courroie souple et continue (20) de glissement destinée à passer sur les rouleaux (15) formant les extrémités du tronçon et à être entraînée par le dispositif d'entraînement, caractérisé en ce que la courroie est plate, l'extrémité de distribution de la courroie aboutit à proximité d'une partie adjacente de l'ensemble qui se trouve à un niveau inférieur au niveau de la surface supérieure de la courroie, la largeur comprise entre la piste supérieure de la courroie (20) et la partie adjacente de l'ensemble étant telle que la chaussure du passager debout, même l'enfant le plus petit, se déplaçant de l'extrémité de distribution de la courroie vers la partie adjacente, est au contact de la partie adjacente avant de perdre le contact avec la courroie, et la vitesse de la courroie par rapport au rayon formé par la courroie lors de son passage sur le rouleau (15) et la distance comprise entre la courroie

et la partie adjacente étant telles qu'un corps quittant l'extrémité de distribution de la courroie et se déplaçant pratiquement à la vitesse de la courroie et tombant sous l'action de la pesanteur est transmis à la partie adjacente suffisamment loin du point de plus proche juxtaposition pour qu'un transfert automatique satisfaisant du corps soit assuré sur la partie adjacente, sans possibilité de mise d'une partie quelconque du corps dans une position dans laquelle il peut être attiré dans l'espace compris entre la courroie et la partie adjacente.

2. Ensemble selon la revendication 1, dans lequel la partie adjacente est l'extrémité d'entrée d'une seconde courroie (20).
3. Ensemble selon la revendication 1, dans lequel la partie adjacente est une plaque (10) de transfert placée entre la première courroie (20) et une courroie d'un second tronçon de tapis roulant de l'ensemble, les deux courroies étant si proches que la chaussure d'un passager debout, même le plus petit enfant, se déplaçant de l'extrémité de distribution de la première courroie à l'extrémité d'entrée de la seconde courroie est au contact de la seconde courroie avant d'avoir perdu le contact avec la première.
4. Ensemble selon la revendication 1, dans lequel la partie adjacente est une plaque d'extrémité placée à l'extrémité de distribution du tapis roulant.
5. Ensemble selon la revendication 2, dans lequel la seconde courroie (20) est une mince courroie continue, plate et souple de glissement revenant autour de rouleaux (15) de petit diamètre, les parties adjacentes des deux courroies étant si proches que la largeur comprise entre les pistes supérieures adjacentes des deux courroies est telle que la chaussure d'un passager debout, même le plus petit enfant, se déplaçant de l'extrémité de distribution de la première courroie à l'extrémité de réception de la seconde courroie, est au contact de la seconde courroie avant de perdre le contact avec la première courroie, et la disposition est telle qu'aucune partie de chaussure d'un passager n'est au contact avec une partie quelconque se trouvant au niveau général de la surface des courroies qui ne fait pas partie de l'une des courroies ou au-dessous de ce niveau.
6. Ensemble selon la revendication 3, dans lequel la plaque (10) de transfert est placée entre les tronçons adjacents de tapis roulant de l'en-



semble et est disposée sur la largeur de celui-ci, la plaque de transfert ayant une surface supérieure lisse (11) et étant réalisée afin qu'elle se termine à chaque bord si près de la courroie du tronçon adjacent que l'entrée d'un corps entre la plaque de transfert et la courroie soit limitée, et à un niveau tel qu'une transition progressive est réalisée de la courroie du premier tronçon à la courroie du second tronçon, la plaque de transfert étant placée, au moins du côté adjacent à l'extrémité de distribution du premier tronçon, au-dessus du niveau général de la surface de la courroie correspondante, l'espacement de la plaque de transfert au-dessous du niveau général de la surface de la courroie (20) étant tel qu'un corps se déplaçant de l'extrémité de distribution de la courroie et tombant sous l'action de la pesanteur ne peut pas frapper la plaque de transfert avant d'avoir dépasser le raccord entre la courroie et la plaque de transfert.

7. Ensemble selon la revendication 3 ou 6, dans lequel la plaque de transfert (10) a un prolongement vertical descendant entre les courroies afin qu'il donne à la plaque de transfert une rigidité nécessaire pour résister à la déformation au passage du poids des passagers.

8. Ensemble selon l'une des revendications 3, 6 et 7, dans lequel la surface supérieure (11a) de la plaque de transfert est courbe.

9. Ensemble selon l'une quelconque des revendications précédentes, comprenant des tronçons adjacents de tapis roulant fonctionnant à des vitesses différentes et destinés à provoquer l'accélération ou la décélération des passagers se déplaçant sur ces tronçons.

10. Ensemble selon la revendication 9, dans lequel un tronçon de l'ensemble ayant la vitesse la plus grande est une simple courroie souple, mince et longue (27) de glissement qui peut revenir autour d'un rouleau dont le diamètre est inférieur à 70 mm.

11. Ensemble selon la revendication 9, dans lequel un tronçon de l'ensemble ayant la plus grande vitesse est formé d'au moins deux longues courroies minces et souples (27) de glissement capables chacune de revenir autour de rouleaux dont le diamètre est inférieur à 70 mm, et les raccords entre les deux courroies sont tels que revendiqués dans la revendication 5 ou 6.

12. Ensemble selon l'une quelconque des revendications précédentes, comprenant un tronçon supplémentaire de tapis roulant colinéaire au premier tronçon de tapis roulant, le tronçon supplémentaire comprenant une courroie (62) à nervures, une plaque de transfert placée entre le premier tronçon de tapis roulant et le tronçon supplémentaire, le tronçon supplémentaire ayant un peigne (60) disposé le long de la courroie à nervures, le peigne ayant des dents comprenant des organes longitudinaux qui sont plus étroits et moins profonds que la distance comprise entre les nervures de la courroie à nervures et qui sont disposés sur la longueur de la courroie à nervures de la plaque supplémentaire de transfert à une autre plaque de transfert placée près de l'autre extrémité de la courroie à nervures.