

[54] **CONVEOR BELT AND SYSTEM  
HAVING LOW FRICTION CONTACT  
SURFACES**

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[51] Int. Cl. .... **A63b 23/06**

[58] Field of Search ..... **272/69; 198/184**

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[57] **ABSTRACT**

A conveyor belt and system as shown in which an endless belt is secured between two rollers. The belt comprises a web member having an upper frictional surface to which a web liner is secured therebeneath, the web liner being selected from a material having a low coefficient of friction. A planar base member is provided beneath the web and web liner, and a base liner selected from a material having a low coefficient of friction is positioned atop the planar base. The base liner comprises a plurality of laterally spaced longitudinally extending strips positioned to provide a support surface for the web liner. A pair of end rollers are spaced at each end of the conveyor in proximate relationship to the base. The resultant conveyor belt and system provides for a smooth passage of parts for objects atop the frictional surface of the web in the absence of moving parts and required lubrication. One embodiment is shown where the conveyor belt and system is employed in a jogger.

**5 Claims, 12 Drawing Figures**

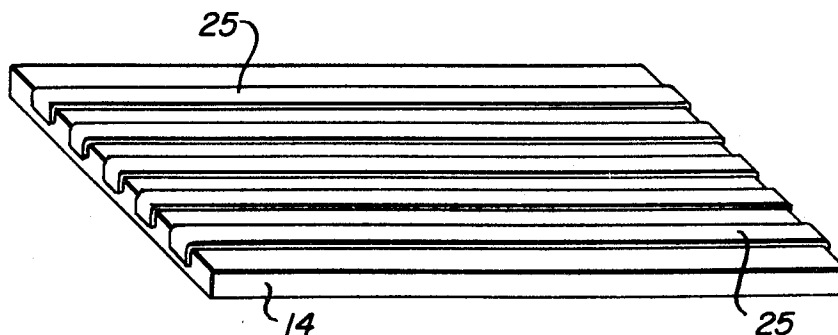


**FIG. 1**

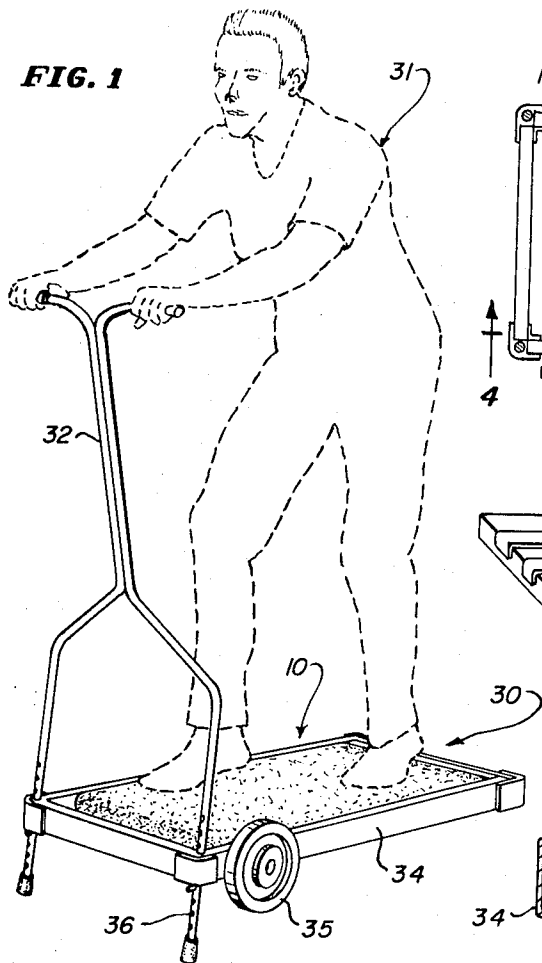


**FIG. 2**

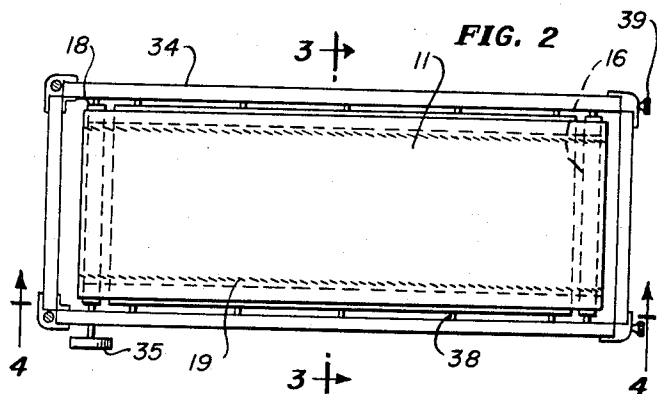


**FIG. 7**

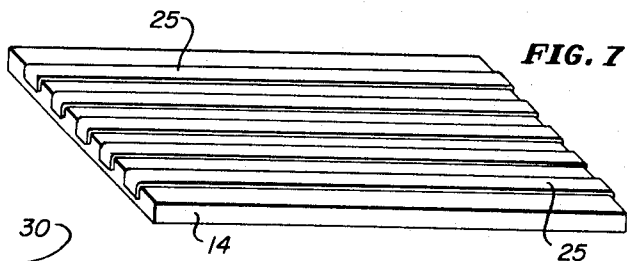


**FIG. 3**

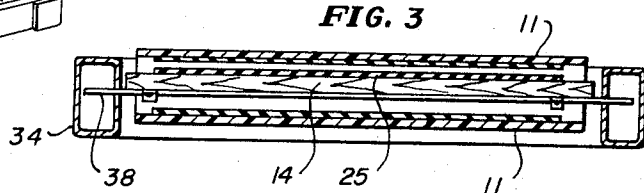


**FIG. 4**

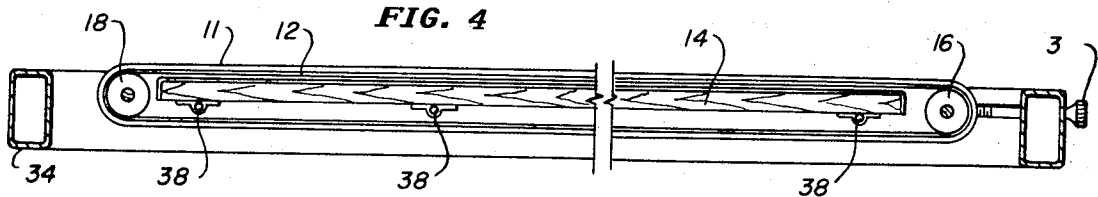


**FIG. 5**

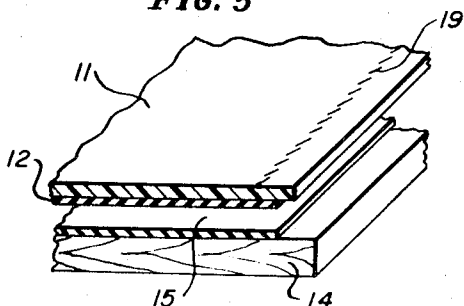
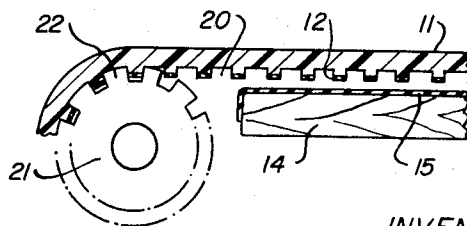


**FIG. 6**



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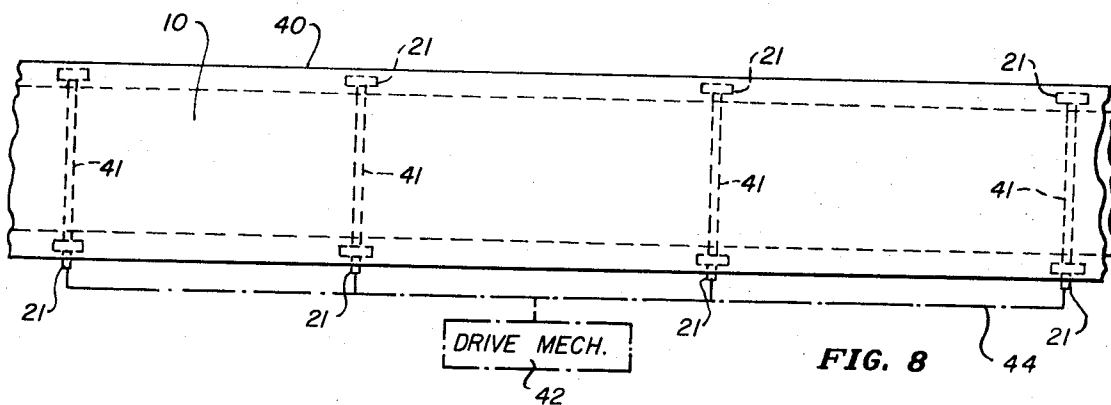
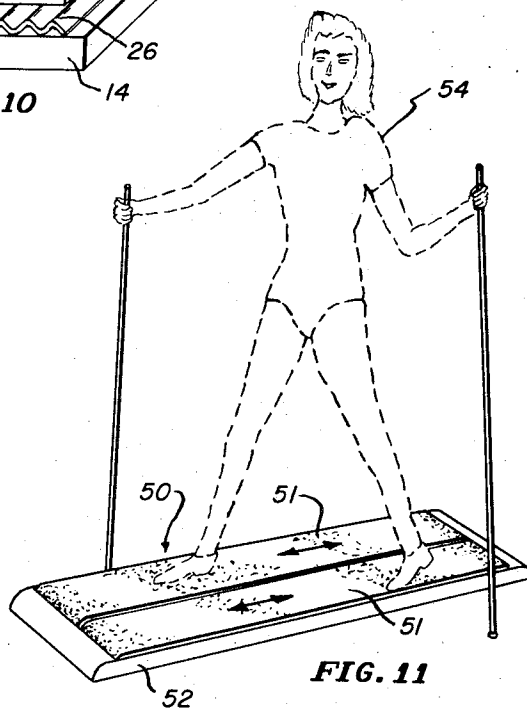
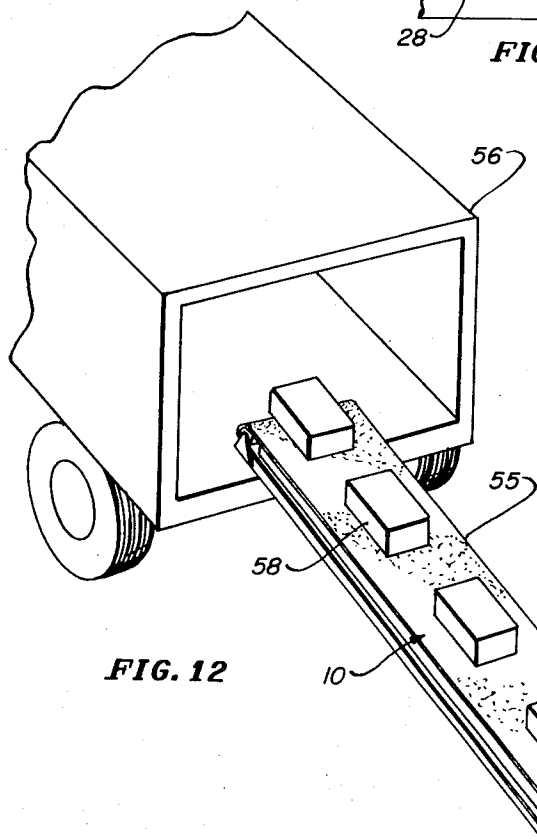
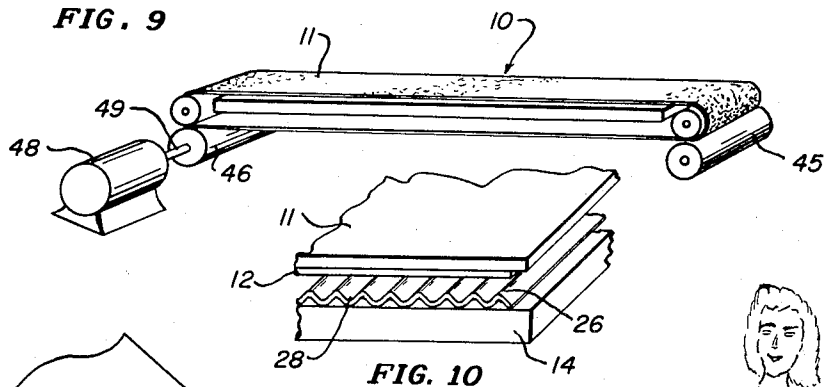


FIG. 9



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## CONVEYOR BELT AND SYSTEM HAVING LOW FRICTION CONTACT SURFACES

### BACKGROUND OF INVENTION

Conveyor belts have been known for years and are employed in a whole host of constructions. Many have been used for moving gravel, coal, and mine outputs for many miles. Similarly conveyor belts are extensively used in factory operations for moving parts. More recently as exercising techniques have improved, conveyor belts are employed in joggers, ski exercisers, and the like.

Invariably the conventional conveyor belts are tensioned between end drive rollers and ride atop a plurality of other rollers. While such a construction will move materials along the belt, because the belt itself flexes, a bumpy ride is experienced as the carried part passes over a roller. The same is accentuated when a plurality of rollers are provided beneath a belt for a jogger, and the most faithful reproduction of the walking or running exercise will relate to running or walking on a platform of marbles, or gravel. Similarly, when conveyor belts are used in factories, and a plurality of rollers support the belts, a bouncing or jogging can occur, which, when very fragile parts or electronic assemblies are being moved, can be potentially damaging to the work in process.

### SUMMARY OF INVENTION

In view of the foregoing it is a primary object of the present invention to provide a conveyor belt construction which utilizes a friction reducing inner surface and is supported on a flat surface thereby eliminating the costly use of intermediate rollers, and providing a very smooth ride for any parts conveyed atop the belt. More specifically the outer portion of the belt may be of any conventional fabric or composite sturdy material, but the inner portion of the belt is a low-friction sheet of material such as nylon, Teflon, Orlon, or other plastics having low friction coefficient characteristics. Additionally, the inner portion of the belt moves against a flat surface the top of which is similarly lined with a low coefficient of a friction material which may be either sheet plastic of the same characteristic as that provided on the inner side of the belt, or a lining atop the flat surface.

In one modification of the invention sprocket pockets are provided within the belt so that the same can be powered at varying stations along its length, the intermediate portions between the sprocket pockets serving to provide a flat smooth riding low friction surface.

### DESCRIPTION OF DRAWINGS

FIG. 1 is a perspective view of a jogger employing the conveyor illustrative of the present invention.

FIG. 2 is a top view of the jogger shown in FIG. 1.

FIG. 3 is a transverse sectional view of the jogger shown in FIGS 1 and 2 taken along Section Line 3—3 of FIG. 2. FIG. 4 is a longitudinal section of the jogger shown in FIG. 2 taken along Section Line 4—4 of FIG. 2 and shown in enlarged scale.

FIG. 5 is an exploded perspective diagrammatically illustrating the relationship between the conveyor and its support.

FIG. 6 is a partially sectioned diagrammatic view illustrative of the use of a sprocket in connection with the conveyor.

FIG. 7 is a perspective view of an alternative base having a strip-like liner.

FIG. 8 is a diagrammatic plan view of a moving sidewalk employing the conveyor illustrative of the present invention.

FIG. 9 is a diagrammatic perspective view illustrating an alternative drive mechanism for a conveyor illustrative of the invention such as may be employed on a production line facility.

FIG. 10 is a perspective partially broken view of the same character as shown in FIG. 5 but illustrating the employment of a corrugated base.

FIG. 11 is a perspective partially diagrammatic view of a ski jogger employing a conveyor illustrative of the present invention.

FIG. 12 is a perspective view of an unloader employing a conveyor illustrative of the present invention in cooperation with a truck and boxes being unloaded therefrom.

### DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

The conveyor 10 illustrative of the present invention is shown at the outset in a jogger 30 where it will be seen that an exercising man 31 is walking atop the jogger 30 holding the hand grip 32. The jogger has a generally rectangular frame 34 at its base portion with support legs 36 at the front portion which are an extension of the hand grip 32.

Referring now to FIG. 2 it will be seen that the jogger 30 has an end roller 16 at one end thereof and a drive roller 18 at the other end, the drive roller 18 being directly coupled to a fly wheel 35. With reference to FIG. 3, it will be further seen that the base 14 is secured to the frame 34 by means of base pins 38.

For a better understanding of the specifics of the conveyor 10 reference will be made to FIG. 5 where the elements of the conveyor and the base are broken up into a web 11 which is at the very top, the web having a web liner 12 secured thereto by web stitches 19. The base 14 is a planar member and has a base liner 15 which is positioned atop the base 14 and proportioned to slidably and frictionally engage the web liner 12. A tension member 39 is provided to coact with the end roller 16 (as shown in FIG. 4) to secure the frictional engagement between the belt liner 12 and the drive roller 18. In operation, the conveyor 10, particularly in the jogger 30 more faithfully duplicates the walking action. By way of contradistinction, most joggers known in the art have a single conveyor belt between the end rollers as shown, and the belt is then supported by a plurality of transverse rollers. The effect is unnatural, more like walking on pebbles or marbles than the type of walking which stimulates realistic exercise. Prior to describing additional embodiments of the subject conveyor which can be used for people movers such as a moving sidewalk, conveyor belts for moving fragile parts along an assembly line in a factory, ski joggers, and cargo unloaders, some description of the material properties is pertinent.

The coefficient of friction of mild steel on mild steel is approximately 0.74. On the other hand, if the inter-

face between the mild steel members is greased, a coefficient of 0.09 is experienced. Such a sliding coefficient of friction is comparable to that sought to be achieved by the conveyor of the present invention, but obviously in the absence of a greased surface the contamination of which would be highly undesirable in a jogger, people mover, and others of the applications shown. To achieve such a reduction in friction with an operable conveyor belt one notes that the coefficient of friction of Teflon on steel is 0.04. Similarly ORLON 80 (nylon) on steel (ribbed) is as low as 0.03. NYTRON GS (nylon) on ribbed steel is also 0.03. Plastic against plastic where the web liner 12 and the base liner 15 are Teflon, nylon, or other sheet plastics approximates a coefficient of friction of 0.05. When ribbed steel is employed, and the ribbed steel is coated, coefficients of friction in the order of 0.02 to 0.05 may be experienced. Similarly when the plastic is used in strips so that the base liner 15 is a plurality of base liner strips 25 as illustrated in FIG. 7, particularly where the widths are approximately  $\frac{3}{4}$  inch on  $\frac{3}{4}$  inch spacing, the coefficient of friction can be reduced somewhat over that of plastic against plastic as shown in FIG. 5. Additional acceptable plastic sheets are acetal or those sold under the trademark DELRIN. Ethylene propylene is also acceptable, and of course Teflon where the sheet material is available is highly desirable. As shown in FIG. 5 the web liner 12 is secured to the conveyor web 11 by means of web stitching 19. Other means such as lamination, precast riveting, and additional techniques of fastening are contemplated and the invention is not limited to the specific type of stitching as shown and described above.

Bearing the above in mind as a broad basic proposition for the use of a conveyor illustrative of the invention, reference will be made to FIG. 8 where it will be seen that a moving sidewalk 40 is shown which may have a width up to 4 or 5 feet, and a length of unlimited dimension. The conveyor 10 is driven by drive mechanism 42 through a drive train 44 which actuates the sprockets 21 secured at the edges of the conveyor 10 to the sprockets 21 and a plurality of longitudinal sprocket pockets 20 provided in the conveyor web 11 (see FIG. 6). With further reference to FIG. 6, diagrammatically illustrating the concept shown in FIG. 8 on the moving sidewalk 40, it will be seen that the sprocket pockets 20 are recessed through the web liner 12 and penetrate the main body of the web 11. The sprocket 21 has a plurality of teeth 22 which drivingly engage the sprocket pockets 20. In the larger embodiments such as that shown in FIG. 8 of the moving sidewalk 40, it will be appreciated that the spans between the cross-shafts 41 and their related sprockets 21 may be at intervals of 5 to 50 feet depending upon the loading and frictional forces which are a function of the people using the moving sidewalk. Thus a relatively infinite length can be developed, and persons walking on the sidewalk will not be subjected to the rolling action of a plurality of rollers supporting the conveyor 10, but rather feel that they are on a flat surface at all times.

An additional illustration of the conveyor 10 is shown in FIG. 9 where it will be seen that the same can be driven by means of a motor 48 which, through its drive shaft 49, rotates a drive wheel 46. The drive wheel 46 engages the frictional face of the web 11 of

the conveyor 10, the conveyor 10 having the same basic elements as those described above in connection with the jogger 30. The flat smooth action of the motion of the web 11 reduces the tendency of fragile parts such as timing mechanisms, electronic controls, and the like, from being damaged or jostled in the course of assembly as they move between one station and another in a factory.

FIG. 10 illustrates in perspective view a different type of planar base 14 which may be employed, in this instance being shown as having a plurality of corrugations presenting a corrugated base 26 at the upper portion. The corrugated base 26 is sprayed or otherwise provided with a corrugated base liner 28, and a superior coefficient of friction between the corrugated base liner 28 and the web liner 12 is a result.

Further illustrating the broad application that the conveyor 10 of the present invention has is the illustration of a ski jogger 50 in FIG. 11 where the skier 54 is able to move her legs back and forth on the flat surfaces of the parallel ski conveyors 51. The ski conveyors 51 are secured within a ski frame 52 between end rollers (not shown) and accompanied by an adjustable tension device for each of the pair of ski rollers 51 comparable to that referred to above with the jogger 30. The sensation at all times is that of the feet on smooth snow, rather than the feet on a mountain of pebbles which is wholly unrealistic to a skier's preparation for actual skiing.

Finally, a further illustration of the illustrative conveyor 10 appears in FIG. 12 where an unloader 55 is employed at the rear of a truck 56 upon which boxes 58 or other cargo can be positioned and through their own gravitational force roll down the conveyor 10 of the unloader 55 to its end portion for further removal. It will be appreciated that while a truck 56 is shown here, the same type of unloader 55 is applicable to aircraft, trains, boats, and indeed from two-story warehouses to loading a truck at a lower level.

In review it will be seen that a conveyor has been disclosed and described in which a flat base is employed to fix a smooth moving action and render the upper portion of the web relatively inflexible. By producing the same in an environment with a low coefficient of friction between the web and the base, a whole host of applications arise covering the gamut from a walking jogger to a ski jogger, as well as a people mover in the form of a moving sidewalk. Further examples abound in the conveyORIZED factory operations as well as warehousing and unloading.

While the invention has been described in connection with specific embodiments and applications, no intention to restrict the invention to the examples shown in contemplated, but rather it is applicant's intention to include within the invention all of the subject matter defined by the spirit as well as the letter of the annexed claims.

What is claimed is:

1. A conveyor belt and system comprising in combination,
  - a web member having an upper surface with a high coefficient of friction,
  - a web liner positioned beneath and secured to said web member and in close proximity thereto,
  - said web liner being formed of a material having an under surface with a low coefficient of friction,

a planar base member underlining said web member and said web liner,  
said planar base providing lateral and longitudinal support for said web member and web liner,  
a plurality of laterally spaces longitudinally extending strips mounted on said planar base and positioned to provide a support surface for accommodating the movement therealong of said web liner,  
said longitudinally extending strips being formed of a material having a low coefficient of friction,  
a pair of end rollers at each end of the conveyor for supporting said web member,  
said planar base and longitudinal strips extending substantially from one of said end rollers to the opposing end roller,  
whereby said web member is permitted to move between said end rollers and is supported along its longitudinal path of movement by said planar base having said longitudinal strips in touching contact with the under surface of said web liner, the low coefficient of friction as between said web liner and said longitudinal strips providing a smooth path of travel for said web member throughout its longitudinal path of travel.  
2. The conveyor belt and system of claim 1 above, which further includes

a plurality of socket pockets provided in the under portion of said web member and said web liner at the edges thereof,  
a plurality of sprockets provided in spaced longitudinal relation along said planar base at the edges thereof and extending therethrough in sequential driving relationship with the socket pocket on said web member,  
and means for rotating the sprockets whereby the web member can be driven along the top of the planar base smoothly and for a length limited only by the materials employed.  
3. In the conveyor belt and system of claim 1 above, a jogger construction in which said base member is inclined to the horizontal,  
means for supporting one end of the base in an elevated position,  
said rollers being journaledly engaged by the base at its end portions,  
and hand-hold means extending from the base for engagement by the operator.  
4. In the conveyor belt and system of claim 1, an interface coefficient of friction less than 0.10.  
5. In the conveyor belt and system of claim 1, the width of the strips and their lateral spacing being substantially the same.

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