

"Improvements in passenger conveyors"

The present invention relates to the combination of a passenger conveyor provided with a plurality of steps endlessly connected; step driving chains for driving said steps; driving sprockets driving said chains with said step
5 driving chains wound around said driving sprockets; and a tensioning device for providing tension to said step driving chains.

British Patent Specification 719,694 discloses a
10 passenger conveyor having a chain tensioning device which is provided to absorb the shock generated when a chain engages with a sprocket wheel.

The device disclosed in the above British Patent Specification is provided with elastic bodies on both sides
15 of the sprocket wheel and the link plates of the chain are received by the elastic bodies so that the shock generated when the chain engages with the base of the teeth of the sprocket wheel is moderated.

The link plates of the chain are generally formed by
20 punching copper plate with a press. Thus, in the configuration disclosed in the above described British Patent Specification, edges (thickness portions) of the link plates are repeatedly pressed into the elastic bodies. Consequently, the elastic bodies become extremely worn and
25 the lifetime thereof is shortened, so that the shock absorbing effect disappears in a short period of time.

Furthermore, in the configuration disclosed in the

above British Patent Specification it is a premise that the teeth of the sprocket wheel are formed by machining. The formation of the teeth of the sprocket wheel and the execution of the elastic bodies make the production of a sprocket wheel having this shock absorbing effect complicated and difficult.

It is an object of the present invention to overcome partially or wholly the above referred to disadvantages.

According to the present invention there is provided in combination a passenger conveyor provided with a plurality of steps endlessly connected; step driving chains for driving said steps; driving sprockets driving said chains with said step driving chains wound around said driving sprockets; and a tensioning device for providing tension to said step driving chains, said tensioning device being characterized by comprising disc wheels provided with rubber based elastic bodies on the peripheral surfaces thereof which have a width smaller than the inner width of the link plates of said step driving chains so that the chain rollers of said step driving chains are received by said rubber based elastic bodies.

In the above construction, each chain roller of a chain wound around the disc is received by the elastic body provided on the outer periphery of the disc. Therefore, no shock is generated between metals such as the chain rollers and the teeth of the sprocket wheel, and unpleasant noises and vibration can be prevented. In addition, since the elastic body receives each chain roller, the degree of wear

is small, compared with the case in which elastic bodies receive the edges of the plates, so that the shock absorbing effect can be thus maintained over a longer period of time than in conventional devices.

5 The present invention will now be described in greater detail by way of example with reference to the accompanying drawing wherein:-

Fig. 1 is a schematic side view of the whole of a passenger conveyor;

10 Fig. 2 is an enlarged view of an embodiment of the chain tensioning device; ~~for driving the steps of a passenger conveyor;~~ and

Fig. 3 is an enlarged sectional view taken along the line A-A in Fig. 2.

15 An embodiment of the present invention will now be described below with reference to Figs. 1 to 3.

A passenger conveyor generally comprises a frame 1 which supports the dead weight thereof and a passenger load; a pair of right and left balustrades 2 which are erected on
20 either side of the frame 1 in the longitudinal direction thereof, and which are provided with moving handrails on the peripheries thereof; a plurality of steps 3 which are placed between the two balustrades 2, driven in synchronism with the moving handrails, and connected together in an
25 endless loop; a pair of right and left step driving chains 4 which are individually connected to an under portion of a plurality of the endlessly connected steps 3 and which are disposed in the longitudinal direction of the frame 1; a

pair of right and left driving sprocket wheels 5 which are placed in the interior of the frame 1 at the upper end thereof and around which the corresponding step driving chains 4 are wound; a step driving chain tensioning device 6 which is provided in the interior of the frame 1 at the lower end thereof and around which the step driving chains 4 are wound so as to provide a constant tension; and a driving apparatus 7 which is provided in the interior of the frame 1 at the upper end thereof and which imparts a driving force to the driving sprocket wheels 5.

The driving chain tensioning device 6 comprises a pair of wheels 8 made of discs, elastic bodies 9 made of a rubber based material, such as polyurethane rubber, which are wound around the peripheries of the wheels; a shaft 10 for supporting the two wheels 8; bearings 11 for rotatably supporting each end of the shaft 10; bearing boxes 12 for covering the bearings 11; guide rails 13 which are laid on a fixed member along the direction of the movement of the steps and which slidably guide the bearing boxes 12; rods 14 connected to the bearing boxes 12; engagement fittings 15 through which the other ends of the rods 14 pass and which are fixed to fixed members; and springs 16 which are placed between the engagement fittings 15 and the ends of the rods 14 and which apply a constant force to the step driving chains 4.

The elastic bodies 9 are wound around the wheels 8 by the following method. Firstly, each wheel 8 is so formed that the width W of its periphery is smaller than the inner

width (W_c) between link plates 17 of the step driving chains 4 and is substantially equal to the equivalent dimensions of chain rollers 18. A groove 19 is formed around the entire peripheral surface 8S of each wheel 8 formed in this manner, and the elastic body 9 having a rectangular section fitted into the groove. A peripheral surface 9S of the elastic body 9 is allowed to project from the groove 19 so that the chain rollers 18 are elastically supported by the projecting portion of the peripheral surface (9S). At the same time, the peripheral surface 8S of the wheel 8 is placed between the link plates 17 and is inserted as far as the side of the roller 18 so that the wheel (8) and the link plate (17) form an overlapping portion L. In addition, the diameter D of the elastic body 9 on each wheel 8 is set so that no integral multiple of the chain pitch angle of the step driving chains 4 wound therearound is 360 degrees.

The elastic bodies 9 may be mounted onto the peripheral surfaces 8S of the wheels 8 by fixing them in the grooves 19 by means of adhesive or moulding, or each elastic body may be formed into a ring and fitted into its groove by employing the elasticity of the elastic body 9. In addition, without forming grooves 19 on the wheels 8, the elastic bodies may be fixed onto the peripheral surfaces 8S by one of the above described means.

In the above mentioned configuration, when the passenger conveyor is driven, the step driving chains 4 are driven by the driving sprocket wheels and are endlessly moved between the sprocket wheels and the chain-tensioning

device 6 so as to move the steps 3. The step-driving chains 4 are guided on the peripheries of the wheels 8 by the overlapping portions L between the link plates 17 and side surfaces 20 on the peripheries of the wheels 8 so that they are wound around the wheels 8 without separating therefrom. In addition, the wheels 8 are tensioned by the springs 16 through the rods 14 and apply a constant tension to the step driving chains 4 so as to smoothly rotate them. When the chain rollers 18 are received by the elastic bodies 9 so that the shock is absorbed, whereby it is possible to prevent the generation of unpleasant noises and vibration. In addition, the relationship between the chain pitch angle θ of the step driving chains 4 and the diameter D of the elastic bodies 9 allows the contact positions between the chain rollers 18 and the elastic bodies 9 to be constantly changed so that the chain rollers are successively brought into contact with a series of succeeding positions. Therefore, there is sufficient time between the moment when the chain rollers 18 separate from the elastic bodies 9 and the moment when they are again brought into contact with their original positions. This means that there is a large reduction in frequency at which the chain rollers 18 are supported, in comparison with a device in which the chain rollers 18 are repeatedly supported at particular positions on the elastic bodies 9 and thus enables the lifetime of the elastic bodies 9 to be prolonged. However, a configuration in which the chain rollers 18 are solely brought into

contact with the elastic bodies 9 may decrease the amount of wear of the elastic bodies 9 and prolong the lifetime in comparison with the configuration in which the edges of the link plates are brought into contact with the elastic
5 bodies 9.

Furthermore, the maintenance and inspection of the wheels 8 may be mainly made with emphasis on the elastic bodies 9 because the step driving chains (4) are mainly brought into contact with the elastic bodies 9 and it is
10 thus sufficient to replace worn elastic bodies (9) alone. Therefore, the total maintenance cost of the passenger conveyor is lowered.

As described above, the embodiment of the present invention can be put into practice by omitting the portion
15 which has conventionally comprised a sprocket wheel and has required an expensive gear cutting operation and replacing it with a portion having a simple configuration in which the elastic bodies are provided on the peripheries of the simple disc wheels, and yet which adequately functions as the
20 tensioning device 6 for the step driving chains 4.

The present invention provides a step-driving chain tensioning device of a passenger conveyor which enables a simple configuration and effects the shock absorbing function required.



CLAIMS:-

1. In combination a passenger conveyor provided with a plurality of steps endlessly connected; step driving chains for driving said steps; driving sprockets driving said
5 chains with said step driving chains wound around said driving sprockets; and a tensioning device for providing tension to said step driving chains, said tensioning device being characterized by comprising disc wheels provided with rubber based elastic bodies on the peripheral surfaces
10 thereof which have a width smaller than the inner width of the link plates of said step-driving chains so that the chain rollers of said step driving chains are received by said rubber based elastic bodies.
 2. The combination according to claim 1, wherein the
15 diameter of said elastic bodies is so set that no integral multiple of the chain pitch angle will be equal to 360 degrees.
 3. The combination according to claim 1, wherein the peripheries of said wheels have portions overlapping said
20 link plates of said step driving chains.
 4. The combination of a passenger conveyor and a chain tensioning device constructed substantially as herein described with reference to the accompanying drawing.
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