

DRIVE SYSTEM OF A PASSENGER CONVEYOR

This invention relates to a drive system of a passenger conveyor, such as an escalator.

Heretofore, in one type of drive system of a moving staircase or passenger conveyor known in the art, such as the one disclosed in US Patent No. 1,956,154, at least five sprocket wheels including a pair of step chain drive sprocket wheels, a pair of handrail drive sprocket wheels and a drive sprocket wheel receiving motive force from a drive motor are supported on a drive shaft at an upper end portion of the \_\_\_\_\_ conveyor.

There has in recent years been a demand for increasing the effective area of a space within a building by reducing the area of a space occupied by passenger conveyors.

Various programs have been under way in many quarters to satisfy this demand. Research and experiments conducted by us have shown that in the passenger conveyor drive system of the aforesaid construction, the drive system as a whole constitutes a bottleneck that makes it difficult to reduce the width of the passenger \_\_\_\_\_ conveyor as a whole, because of the arrangement that the step chain drive sprocket wheels, drive

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sprocket wheel and handrail drive sprocket wheels are arranged in side-by-side relation at one end portion of the drive shaft and the drive sprocket wheel has the number of the teeth on its rim increased as its lift is increased.

5 This invention has as an object the provision of a drive system of a passenger conveyor having its width reduced so as to thereby reduce the area of a space necessary for installing the conveyor.

According to the present invention there is provided a drive system of a passenger conveyor comprising a pair of step chains connected  
10 to a plurality of steps for accommodating passengers and located on opposite sides of the steps, a pair of step chain drive sprocket wheels and a pair of step chain follower sprocket wheels having the pair of step chains trained over them, a drive sprocket wheel secured to a drive shaft having the step chain sprocket wheels rotatably supported thereon,  
15 to transmit a motive force to said drive shaft, a drive motor transmitting motive force to said drive shaft through a drive chain, and a handrail drive sprocket wheel supported on said drive shaft for transmitting motive force to a pair of handrails moving in synchronism with the steps, wherein the drive sprocket wheel for transmitting motive  
20 force to the drive shaft is arranged at one end of said drive shaft outwardly of one of said step chain drive sprocket wheels and the handrail drive sprocket wheel for transmitting motive force to the handrails is arranged at the opposite end of the drive shaft outwardly of the other said step chain drive sprocket wheel, so that handrail drive sections  
25 arranged on opposite sides can be actuated by the motive force transmitted from the handrail drive sprocket wheel through a chain.

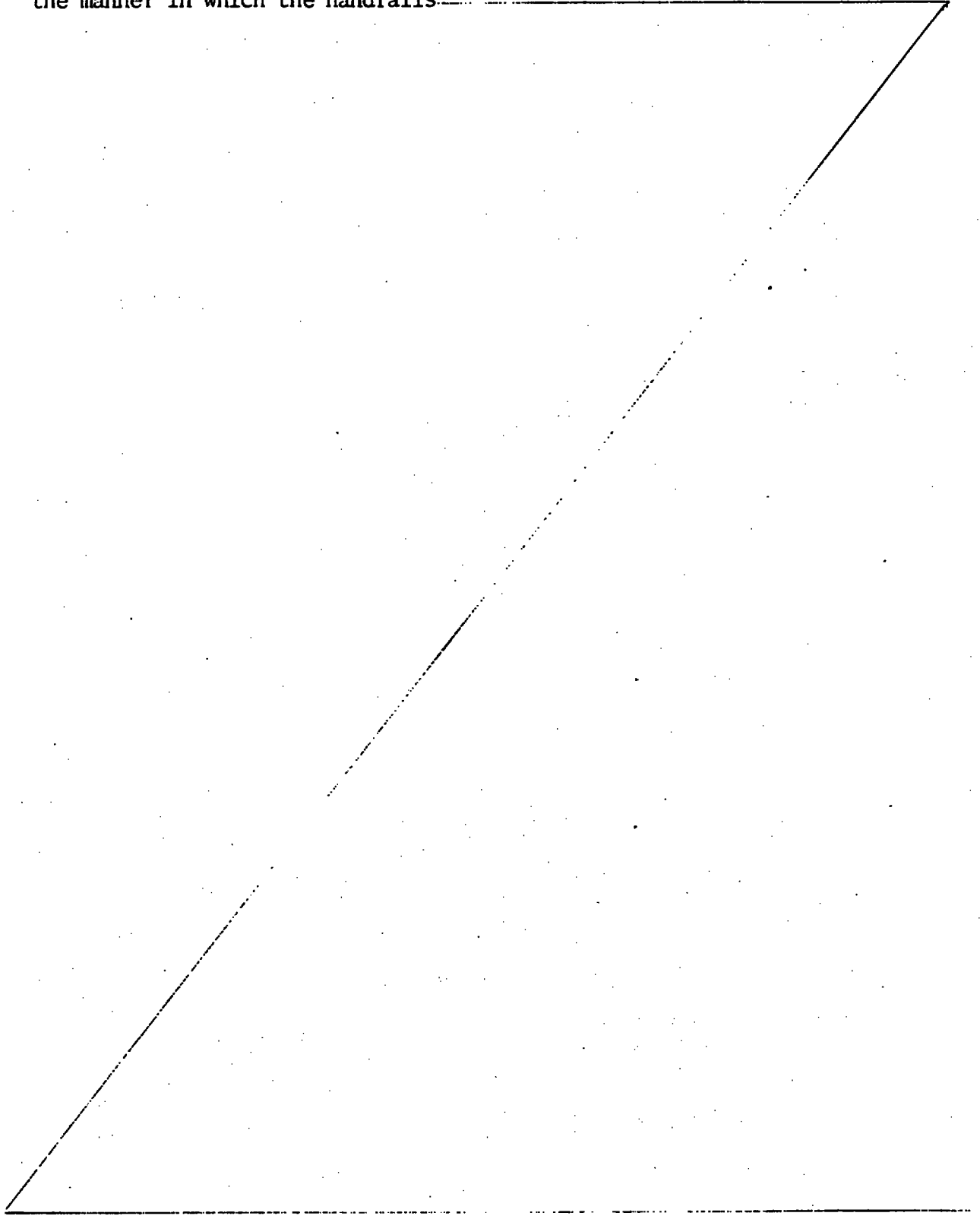
Therefore, a drive sprocket wheel is arranged at one outer side of a pair of step chain drive sprocket wheels for a drive shaft and a handrail drive sprocket wheel is arranged at the other outer side thereof,  
30 in view of the fact that the force necessary for driving the handrails does not substantially increase even if the lift of the conveyor is increased and the motive force can be transmitted to the handrails by using only one handrail drive sprocket wheel.

Embodiments of the present invention will now be described by  
35 way of example with reference to the accompanying drawings, in which:-

Fig. 1 is a side view of a passenger conveyor or escalator in its entirety, in a direction along line I - I of Fig. 4, in which the

present invention can have application, showing its general construction;

Fig. 2 is a side view of a passenger conveyor or escalator in its entirety, in a direction along line II - II of Fig. 4, showing the manner in which the handrails



are driven;

Fig. 3 is a plan view, on an enlarged scale, of the drive system of the escalator comprising one embodiment of the invention;

5 Fig. 4 is a plan view of the escalator, showing the manner in which the handrails are driven by the drive system according to the invention; and

Fig. 5 is a plan view corresponding to Fig. 4 but showing a modification of the drive system therein.

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One embodiment of the invention will now be described by referring to the drawings. Fig. 1 shows the general construction of an escalator in which the invention can have application. In the figure, a drive  
15 motor 1 has directly connected thereto a reduction gear 2 having an output shaft supporting a drive sprocket wheel 3 of a minor diameter which drives a drive sprocket wheel 4 of a major diameter through a drive chain 5, to rotate a drive shaft 6. A pair of  
20 step chain drive sprocket wheels 7 are secured to the drive shaft 6, one on each side thereof, and endless step chains 10 are trained over the step chain drive sprocket wheels 7 and a pair of lower step chain follower sprocket wheels 8 supported on a follower  
25 shaft 9 in such a manner that one endless chain 10 is trained over the chain sprocket wheels 7 and 8 on either side. Steps 11 arranged at regular spacing

intervals are secured to the step chains 10 which are driven from the drive shaft 6 as the latter rotates. Wheels attached to the steps 11 are guided to run on rails 12, 13, 14, 15 and 16.

5                    Fig. 2 shows the manner in which handrails 17 operating in synchronism with the steps 11 are driven. In the figure, parts similar to those shown in Fig. 1 are designated by like reference characters. The drive shaft 6 has secured thereto a handrail drive sprocket  
10 wheel 19 from which motive force is transmitted to handrail follower sprocket wheels 20 through a handrail drive chain 21, so as to operate the handrails 17 through drive pulleys 22. 18 designates a frame.

                  Fig. 3 shows one example of the drive system  
15 according to the invention in an enlarged plan view.

                  As shown in Fig. 3, the drive system according to the invention has the pair of step chain drive sprocket wheels 7 mounted on the left and right ends of the drive shaft 6, and the drive sprocket wheel 4  
20 is located on one outer side of the step chain drive sprocket wheels 7 while handrail drive sprocket wheel 19 is located on the other outer side thereof.

                  As shown in Fig. 4, motive force is transmitted from the handrail drive sprocket wheel 19  
25 through the handrail drive chain 21, handrail follower sprocket wheels 20 and a drive pulley shaft 23 to the drive pulleys 22 to operate the handrails 17.

Heretofore, it has been customary to drive

the handrails 17 by a pair of handrail drive sprocket wheels mounted on opposite ends of the drive shaft 6 as aforesaid, to operate the respective handrails 17.

This construction has caused the drive sprocket wheel  
5 to bulge and increase the width of the drive system.

A solution for the problem that comes to mind may contemplate mounting the handrail drive sprocket wheels between the step chain drive sprocket wheels. However, this section of the system is covered with  
10 the steps and the solution would make it difficult to carry out maintenance and repair.

The invention purposes to obviate the problem by arranging the drive sprocket wheel 4 at one end of the drive shaft 6 and the handrail drive  
15 sprocket wheel 19 at the opposite end thereof. This constructional form not only reduces the width of the drive system as a whole but also permits maintenance and repair to be carried out with ease because the sprocket wheels 4 and 19 are both located outside the  
20 step chain drive sprocket wheels 7. A reduction in the width of the drive system is conducive to a reduction in the width of the passenger conveyor or escalator as a whole. Thus the space occupied by the conveyor can be reduced in area by about 10% by the present invention.

25 Fig. 5 shows a modification of the embodiment in which the drive pulley shaft 23 is eliminated and an intermediate shaft 24 is mounted between the handrail drive sprocket wheel 19 and the drive pulleys

1 22. Motive force is transmitted from the handrail drive  
chain 21 through an intermediate follower sprocket  
wheel 25, intermediate shaft 24, intermediate drive  
sprocket wheels 26 and intermediate chains 27 to the  
5 follower sprocket wheels 20, to thereby drive the  
drive pulleys 22.

In this constructional form, the drive pulleys  
22 can be mounted separately and the latitude with  
which they are mounted can be increased greatly. This  
10 constructional form offers the advantage that it is  
possible to vary the phase of the handrail drive  
sprocket wheel 19 and the follower sprocket wheels 20,  
which is beyond the power of the constructional form  
having only one handrail drive chain 21.

15 In the embodiment shown and described herein-  
above, the handrails 17 are driven by friction through  
the drive pulleys 22. It is to be understood, however,  
that the invention is not limited to this specific  
form of driving and that other form, such as driving  
20 of the handrails by means of a plurality of rollers  
disposed on opposite surfaces of each handrail and  
pressing against the handrail from opposite sides, may  
be used without departing from the scope of the  
invention.

25 From the foregoing description, it will be  
appreciated that the drive system provided by the  
invention has a width which is greatly reduced as  
compared with the width of drive systems of the prior



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art, so that the passenger conveyor as a whole can have its width reduced. This is conducive to a reduction in the area of a space occupied by the passenger conveyor.

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CLAIMS:

1.           A drive system of a passenger conveyor comprising a pair of step chains connected to a plurality of steps for accommodating passengers and located on opposite  
5 sides of the steps, a pair of step chain drive sprocket wheels and a pair of step chain follower sprocket wheels having the pair of step chains trained over them, a drive sprocket wheel secured to a drive shaft having the step chain sprocket wheels rotatably supported  
10 thereon, to transmit a motive force to said drive shaft, a drive motor transmitting motive force to said drive shaft through a drive chain, and a handrail drive sprocket wheel supported on said drive shaft for transmitting motive force to a pair of handrails moving in  
15 synchronism with the steps, wherein \_\_\_\_\_  
\_\_\_\_\_ the drive sprocket wheel for transmitting motive force to the drive shaft is arranged at one end of said drive shaft outwardly of one of said step chain drive sprocket wheels and the handrail drive  
20 sprocket wheel for transmitting motive force to the handrails is arranged at the opposite end of the drive shaft outwardly of the other said step chain drive sprocket wheel, so that handrail drive sections arranged on opposite sides can be actuated by the motive force  
25 transmitted from the handrail drive sprocket wheel through a chain.
2.           A drive system \_\_\_\_\_ as claimed in claim 1, comprising a handrail drive intermediate



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shaft located \_\_\_\_\_ between the handrail drive sections on the opposite sides and the drive shaft, said intermediate shaft receiving motive force from said drive shaft and transmitting motive force to said handrail drive sections.

3. A drive system substantially as hereinbefore described with reference to, and as illustrated in, Figs. 1 to 4 or these Figs. as modified by Fig. 5 of the accompanying drawings.

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