

HANDRAIL DRIVING APPARATUS FOR MAN-CONVEYER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a handrail driving apparatus for a man-conveyer.

2. Description of the Related Art

Figures 1 to 3 show an earlier handrail driving apparatus for the man-conveyer. In the figures, a main frame 1 is generally referred to as "truss" constituting a main body of the man-conveyer. In the main frame 1, a footstep 2 is arranged so as to travel along front and rear wheels' guide rails 3a, 3b, 4a, 4b provided on left, right, top and bottom stages. This footstep 2 is constituted by numerous steps mutually linked in the form of an endless conveyer through axles each penetrating respective one link of left and right footstep chains each constituted by the order of six links per step.

A footstep driver 5 is arranged in the vicinity of an end of a horizontal section on the upper stair's side of the main frame 1. The footstep driver 5 is constituted by a motor, a reduction gear unit, driving sprockets for the left and right footstep chains and so on (not shown). Handrail belts 6 in the form of endless belts are drawn into the main frame 1 through outer peripheries of left and right parapets. The left and right handrail belts 6 are driven by a driving unit mentioned below and do moves synchronously with footstep 2.

Since the earlier handrail driving apparatus for the man-conveyer includes a pair of mechanisms arranged inside the main frame 1 symmetrically, we now describe the only mechanism on one side, hereinafter. With respect to the footstep chain driving sprocket forming the above-mentioned footstep driver 5, a handrail sprocket 7 is arranged so as to rotate coaxially and integrally with the footstep chain driving sprocket. Arranged in the vicinity of an oblique part in the horizontal section of the main frame 1 is a relay idler 9 which operates together with

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the handrail sprocket 7 through the intermediary of a first handrail driving chain 8. The first handrail driving chain 8 is wound around an inside sprocket 9a of the relay idler 9.

The relay idler 9 further includes an outside sprocket 9b around which a second handrail driving chain 10 is wound. After being wound around the outside sprocket 9b, the second handrail driving chain 10 is wound around an idler 11 disposed in the oblique part of the main frame 1. Subsequently, the chain 10 is raised and successively wound around respective sprockets 13 and an intermediate idler 14. The sprockets 13 are arranged coaxially with a plurality (4 pcs. in this case) of handrail driving wheels 12 disposed in a straight line along a top face of the handrail belt 6. Further, the second handrail driving chain 10 is lowered and returned to the relay idler 9 after being wound around a tension roller 15a of a tensioner 15.

Note, the relay idler 9 is provided with a tension adjusting stud 9c which protrudes horizontally. The manipulation of the stud 9c allows the slackening and expansion of the first handrail driving chain 8 to be adjusted since the relay idler 9 is urged in the opposite direction of the driving sprocket 7. Similarly, the tensioner 15 is provided, on the downside, with a tension adjusting stud 15b. The manipulation of the stud 15b to pull the tensioner 15 downward allows the slackening and expansion of the second handrail driving chain 10 to be adjusted.

In the earlier handrail driving apparatus, when driving to rotate the handrail driving sprocket 7 in coaxial and integral with the footstep chain driving sprocket of the footstep driver 5, then the relay idler 9 is rotated through the intermediary of the first handrail driving chain 8 and additionally, through the second handrail driving chain 10, the respective handrail driving wheels 12 are also rotated to frictional-drive the handrail belt 6. Further, rolling wheels 16 are arranged so as to respectively oppose the handrail driving wheels 12 while interposing the handrail belt 6 from the underside. In this way, since the handrail belt 6 is urged against the handrail driving wheels 12 under pressure, the frictional driving force of the handrail driving wheels 12 is transmitted to the handrail belt 6 certainly.

Meanwhile, with an increased diversity in the applications of the handrail driving apparatus, the man-conveyer has been also required to be

set outdoors or have an increased lifting span, in recent years.

Correspondingly, the apparatus has been necessarily required to have an increased driving force in order to prevent the handrail belts from slipping with respect to the driving unit due to raindrops, the increase of traveling resistance, etc.

For such a requirement, it may be expected to enhance the pressure of the handrail driving wheels 12 and the rolling wheels 16 on the handrail belt 6. However, this countermeasure is not preferable because it causes the life span of the belt 6, the wheels 12 and the rolling wheels 16 to be shortened. Therefore, it is generally adopted to increase the number of the handrail driving wheel and the rolling wheel in pairs.

Fig. 4 shows the conventional handrail driving apparatus adopting the above-mentioned countermeasure. Thus, the shown apparatus is provided with four handrail driving wheels 22 and four rolling wheels 26, in addition to four pairs of driving wheels 12 and four rolling wheels 16 of Fig. 1. In the arrangement a second handrail driving chain 20 is wound around the relay idler 9, the idler 11 and further wound over the successive sprockets 13 of four handrail driving wheels 12 through the intermediate idler 14 arranged therebetween. Subsequently, upon completing to wind around intermediate idlers 27, 28, the chain 20 is further wound over the next-coming sprockets 23 of four handrail driving wheels 22 through an intermediate idler 24 and finally wound around the tension roller 15a of the lower tensioner 15.

According to the above-mentioned arrangement, as similar to the earlier apparatus of Fig. 1, the rotation of the footstep driver 5 allows the handrail driving sprocket 7, the cooperating driving chain 9, the relay idler 9 and the cooperating driving chain 20 to rotate in association with each other. Consequently, four handrail driving wheels 12 and four handrail driving wheels 22 in total eight wheels do rotate to frictional-drive the handrail belt 6 together with the rolling wheels 16, 26. In this way, the driving force of the handrail belt can be increased as the number of driving and rolling wheels does increase.

However, it should be noted that even the above-mentioned handrail driving apparatus has a problem as follows. That is, to increase the number of handrail driving wheels and rolling wheels causes the second handrail driving chain 20 to be lengthened extremely, together with the

necessity of the intermediate idlers 27, 27. Therefore, the resultant handrail driving apparatus is complicated in its structure and also requires to adjust the alignment of numerous idlers and sprockets in the same lines, thereby causing an operator's work for establishing or maintaining the apparatus to be troublesome.

In order to solve such a drawback of the apparatus, there is further proposed a handrail driving apparatus equipped with a footstep chain as a power source in Japanese Unexamined Patent Publication (kokai) No. 9-86846.

Note, the footstep chain is generally provided, for every several links constituting one of the successive footsteps, with one through-hole into which an axle having two front wheels attached thereto is inserted. Each through-hole is positioned at the center of the neighboring pins, while each footstep is secured to the axle penetrating the through-hole. Owing to the structure, it is necessary for a sprocket, which is provided for obtaining the power from the footstep chain, to delete one of the sprocket's teeth, which would interfere with the link in connection with the axle, in advance.

This deletion would not cause any problem when it is applied on an upstairs turning section of the apparatus where the chain meshes with the sprocket by its numerous teeth. However, there would be raised a problem if deleting the tooth from the sprocket in mesh with the chain traveling straight. Because the deletion would cause the meshing condition between the sprocket and the chain to be deteriorated thereby influencing the smooth power transmission therebetween.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a handrail driving apparatus for the man-conveyer, which is simple in structure and also facilitates the operator's work to adjust the alignment of constituents and carry out the maintenance and which is capable of driving the handrail belt effectively upon smooth receipt of power transmission from the footstep chain.

The object of the present invention described above can be accomplished by a handrail driving apparatus for a man-conveyer which includes a plurality of axles each having a footstep fixed thereon and at least one wheel rotatably supported on each of the axles for guiding the

traveling of the footstep, the footsteps being arranged in series, and at least one footstep chain arranged on one side the successive footsteps, the footstep chain consisting of numerous links successively connected with each other in an endless manner for fixing and allowing the axles to penetrate every footsteps, the handrail driving apparatus comprising, at least one side of the man-conveyer;

- a handrail driving sprocket adapted so as to mesh with the footstep chain on one side of the man-conveyer for driving the footstep chain, the handrail driving sprocket having a plurality of teeth of which number is an odd number of times as many as the number of links corresponding to one footstep, provided that, among the teeth, one or more teeth positioned corresponding to the axles are eliminated so as not to interfere with the axles;

- a second sprocket arranged in coaxial with the handrail driving sprocket so as to rotate integrally therewith;

- a handrail driving chain wound around the second sprocket; and

- a handrail driven by the handrail driving chain.

With the arrangement mentioned above, the driving force for driving the handrail driving chain and the handrail belt is obtained from the footstep chain driving the footsteps of the man-conveyer through the handrail driving sprocket. Therefore, since neither conventional long handrail driving chain nor intermediate idler is necessary, the structure of the apparatus can be simplified. Additionally, since the driving apparatus of the invention can be arranged anywhere in an intermediate section of the man-conveyer, it is possible to simplify the structure of the upstairs section of the man-conveyer. Furthermore, if only establishing some handrail driving units of the identical structure, then the handrail driving power can be accomplished as desired.

In the present invention, preferably, the handrail driving apparatus further comprises a pair of guide rails for guiding the footsteps passing through the handrail driving sprocket, one of the guide rails being arranged on a forward path side of the traveling footsteps while the other being arranged on a return path side of the traveling footsteps, wherein the shortest distance between the guide rails is substantially equal to the diameter of a pitch circle of the handrail driving sprocket.

In this case, since the above arrangement allows the handrail driving

sprocket to mesh with the footstep chain on both sides of the forward and return paths, it is possible to obtain the driving force from the footstep chain certainly.

In the above-mentioned arrangement, more preferably, at least the guide rail on the forward path side is arranged so that an inside end thereof directing the handrail driving sprocket occupies the exterior of an outer sidewall of the handrail driving sprocket.

In this case, it is possible to prevent a footstep driving mechanism from interfering with a handrail driving mechanism certainly.

Note, in addition to the above constituents, the handrail driving apparatus may include at least one guide plate which is arranged on the opposite side of the handrail drive sprocket beyond the footstep chain.

In this case, shifting of the footstep chain can be avoided to obtain the handrail driving force from the footstep chain certainly.

According to the present invention, there is also provided a handrail driving apparatus for a man-conveyer which includes a plurality of axles each having a footstep fixed thereon and at least one wheel rotatably supported on each of the axles for guiding the traveling of the footstep, the footsteps being arranged in series, and at least one footstep chain arranged on one side the successive footsteps, the footstep chain consisting of numerous links successively connected with each other in an endless manner for fixing and allowing the axles to penetrate every footsteps, the handrail driving apparatus comprising, at least one side of the man-conveyer;

plural groups of:

one handrail driving sprocket adapted so as to mesh with the footstep chain on one side of the man-conveyer for driving the footstep chain, the handrail driving sprocket having a plurality of teeth of which number is an odd number of times as many as the number of links corresponding to one footstep, provided that, among the teeth, one or more teeth positioned corresponding to the axles are eliminated so as not to interfere with the axles;

one second sprocket arranged in coaxial with the handrail driving sprocket so as to rotate integrally therewith; and

one handrail driving chain wound around the second sprocket; and

a handrail driven by the handrail driving chain in each one of the groups;

wherein a distance between respective centers of the adjoining handrail driving sprockets is established so as to prevent constituents of the plural groups from interfering with each other and is an odd number of times as long as one half of every pitch of the footsteps.

Owing to the above establishment, it is possible to usually attain the engagement of any one of the handrail driving sprockets with the footstep chain, whereby the stable handrail driving force can be obtained as desired.

According to the present invention, there is also provided a handrail driving apparatus for a man-conveyer which includes a plurality of axles each having a footstep fixed thereon and at least one wheel rotatably supported on each of the axles for guiding the traveling of the footstep, the footsteps being arranged in series, and at least one footstep chain arranged on one side the successive footsteps, the footstep chain consisting of numerous links successively connected with each other in an endless manner for fixing and allowing the axles to penetrate every footsteps, the handrail driving apparatus comprising, at least one side of the man-conveyer;

a pair of toothed pulleys arranged in appropriate positions;

an endless double-toothed belt provided, on one side thereof, with a plurality of teeth which mesh with the footstep chain and of which number is a whole number of times as many as the number of links corresponding to one footstep, provided that, among the teeth, one or more teeth positioned corresponding to the axles are eliminated so as not to interfere with the axles and also provided, on the other side, with a plurality of teeth which mesh with the toothed pulleys for their rotation;

a second sprocket arranged in coaxial with one of the toothed pulleys so as to rotate integrally therewith;

a handrail driving chain wound around the second sprocket; and

a handrail driven by the handrail driving chain.

With the arrangement mentioned above, the driving force for driving the handrail driving chain and the handrail belt is obtained from the footstep chain through the endless double-toothed belt. Therefore, since neither conventional long handrail driving chain nor intermediate idler is necessary, the structure of the apparatus can be simplified. Additionally,

since the driving apparatus of the invention can be arranged anywhere in an intermediate section of the man-conveyer, it is possible to simplify the structure of the upstairs section of the man-conveyer. Furthermore, if only establishing some handrail driving units of the identical structure, then the handrail driving power can be accomplished as desired.

Similarly in the above-mentioned invention, preferably, the handrail driving apparatus further includes one guide plate which is arranged on the opposite side of the endless double-toothed belt beyond the footstep chain, for preventing it from disengaging from the endless double-toothed belt.

In this case, of course, the shifting of the footstep chain can be avoided to obtain the handrail driving force from the footstep chain certainly.

These and other objects and features of the present invention will become more fully apparent from the following description and appended claims taken in conjunction with the accompany drawing.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view showing a structure of the conventional handrail driving apparatus for the man-conveyer;

Fig. 2 is a cross sectional view taken along a line II-II of Fig. 1;

Fig. 3 is a side view of the conventional handrail driving apparatus;

Fig. 4 is a front view of the conventional handrail driving apparatus;

Fig. 5 is a front view of the handrail driving apparatus in accordance with a first embodiment of the present invention;

Fig. 6 is a cross sectional view taken along a line VI-VI of Fig. 5;

Fig. 7 is a front view of the handrail driving apparatus in accordance with a second embodiment of the present invention; and

Fig. 8 is a front view of the handrail driving apparatus in accordance with a third embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Embodiments of the present invention will be described with reference to the drawings. First of all, it should be noted that although the following handrail driving mechanism disposed on one side of the man-conveyer is representative of the handrail driving apparatus of the invention, it may be equipped with the same mechanism on each side of the man-conveyer in the width direction. Alternatively, the handrail

driving apparatus may be equipped with the mechanism on one side of the man-conveyer.

Figs. 5 and 6 show the handrail driving apparatus in accordance with the first embodiment of the present invention. A handrail driving sprocket 50 is rotatably carried on a shaft 52 standing on a base 51 mounted on the main frame 1 of the man-conveyer.

The handrail driving sprocket 50 is in the form of a pin gear having involute teeth 54 adapted so as to mesh with a straight footstep chain 53. In the handrail driving sprocket 50, the number of teeth 54 is set to be an odd number of times as many as the number of chain links constituting a pitch of one footstep. Among the teeth provided on the handrail driving sprocket 50, some imaginary teeth 58, which are to be arranged on respective sprocket portions each allowing the penetration of an axle 57 of a front wheel 56 of each footstep 55, are partially eliminated to produce notches around the sprocket 50. For example, providing that six chain links of the footstep chain 53 do constitute one stage of footstep, the total number of teeth will amount to eighteen, i.e. three times as many as six. Note, if the number of multiples gets too large, then the handrail driving sprocket 50 would get larger while causing the man-conveyer itself to be large-sized. Therefore, realistically, the number of multiples is established within a range from 1 to 5. Hereat, the teeth number of the sprocket 50 is three times as many as the number of links forming one stage of footsteps.

A pair of guide rails 59 for guiding and carrying the footsteps 55 are provided for guiding and carrying the footsteps 55. The rails 59 are positioned so that a distance between a "forward" straight section of the upper rail 59 and the "return" straight section of the lower rail 59 is equal to a diameter of the pitch circle of the handrail driving sprocket 50 having the number of teeth of three times as many as the pitch of the footstep. A width 60 of a traveling face of each guide rail 59 subjected to the weight of the front wheels 56 is established so that the guide rail 59 terminates outside the handrail driving sprocket 50. With the establishment of the width 60, the handrail driving sprocket 50 can be prevented from interfering with the guide rails 59. Additionally, the handrail driving sprocket 50 is positioned so that a distance from a meshing section 70 on the forward path's side to another meshing section 71 on the return path's

side is a whole number of times as long as a length of one link of the footstep chain 53. With this positional establishment, the footstep chains 53 on the forward and return paths' sides can be ensured to mesh with the handrail driving sprocket 50 usually.

The handrail driving sprocket 50 is provided with a second sprocket 61 which rotates together and coaxially with the sprocket 50 and includes a number of teeth allowing a handrail belt 64 to travel at the same speed as the footsteps' speed. Wound around the sprocket 61 is a handrail driving chain 62 which drives to rotate handrail drive wheels 63 of the same structure as that of the conventional apparatus of Fig. 1, thereby to travel the handrail belt 64.

In the operation of the handrail driving apparatus of the first embodiment constructed above, the handrail driving sprocket 50 rotates in mesh with the moving footstep chain 53, so that the handrail driving chain 62 is driven by the second sprocket 61 rotating integrally and coaxially with the handrail driving sprocket 50. Owing to the drive of the handrail driving chain 62, the handrail drive wheels 63 are rotated to drive the handrail belt 64.

Although the teeth of the handrail driving sprocket 50 are partially eliminated (see the portions 58) on the assumption that the axles of the front wheels 56 on the footstep chain 53 also engages with the sprocket 50, there is no possibility that the meshing state is simultaneously ineffective on both sides of the meshing sections 70, 71 since an odd number of teeth 58 are removed from the handrail driving sprocket 50. That is, as the meshing condition is ensured at least either one of the meshing sections 70, 71, the sprocket 50 does not race, whereby the driving force can be transmitted certainly.

Furthermore, since a pair of guide plates 81 are arranged on the opposite side of the handrail drive sprocket 50 beyond the footstep chain(s) 53, it can be prevented from disengaging from the sprocket 50, whereby the more reliable meshing can be accomplished.

Next, we describe the second embodiment of the invention with reference to Fig. 7. The handrail driving apparatus of the second embodiment is characterized in that two pairs of handrail driving apparatuses of Figs. 5 and 6 are juxtaposed in order to increase the driving force for the handrail belt 64. Then, in order to prevent the adjoining

handrail driving sprockets from interfering with each other, a distance 65 between respective centers of the sprockets 50 is set to be an odd number of times as long as one half of every pitch of the footsteps. Consequently, there is no case that two handrail driving sprockets 50 are simultaneously out of mesh on the forward and return paths' sides, respectively, whereby great driving force can be obtained certainly. Further, in view of the structure, there is no need to arrange the chain in the complicated form and add any intermediate idler. Additionally, with the simplified structure in the man-conveyer, it is possible to reduce the number of components requiring adjusting in case of the periodic maintenance and inspection. Moreover, it is possible to shorten the period required for the maintenance and inspection.

Note, also in the second embodiment, owing to the provision of the guide plate 81 on the opposite side of the handrail driving sprocket 50 over the footstep chain 53, it can be prevented from escaping from the sprocket 50, whereby the more reliable engagement can be ensured therebetween.

Next, the third embodiment of the invention will be described with reference to Fig. 8. According to the embodiment, a base 90 is attached to the main frame 1 of the man-conveyer. The base 90 has an immovable shaft 91 fixed thereon and a shaft 92 which is movable along the footstep chain 53. A pair of toothed pulley 73, 74 are rotatably engaged with the shafts 91, 92, respectively. Wound around the toothed pulleys 73, 74 is an endless double-toothed belt 78 which has an inner gear 76 formed on an inside face of the belt 78 to mesh with the toothed pulleys 73, 74 and an involute gear 77 formed on an outer face of the belt 78 to mesh with the footstep chain 53 traveling on the return path's side.

Removed from the double-toothed belt 78 are imaginary teeth 79 each of which is to be formed in a portion of the belt 78 in mesh with each portion of the footstep chain 53 allowing the penetration of the axle 57, as similar to the handrail driving sprocket 50 of the first embodiment of Figs. 5 and 6. However, since the double-toothed belt 79 is adapted so as to engage with the footstep chain 53 through several teeth (of the involute gear 77) existing in the straight traveling section of the belt 79, there is no possibility that the belt 79 is disengaged from the footstep chain 53. That is, the number of teeth on the double-toothed belt 79 may be established to be not only an odd number but an even number (i.e. a whole number) of

times as many as the number of links corresponding to one footstep.

As similar to the handrail driving sprocket 50, the fixed toothed pulley 73 is provided with a second handrail sprocket 80 which rotates in coaxial and integral with the shaft 91 and includes numerous teeth for driving the handrail belt 64 at the same speed as that of the footsteps 55. The handrail driving chain 62 is wound around the second sprocket 80 to rotate the handrail drive wheels 63 for driving the handrail belt 64.

In the operation of the handrail driving apparatus of the third embodiment, the double-toothed belt 78 moves due to the engagement of the teeth on the straight section with the moving footstep chain 53, so that the toothed pulleys 73, 74 are rotated together with the second sprocket 80. In this way, the rotation of the second sprocket 80 allows the handrail driving chain 62 to be driven to rotate the handrail drive wheels 63, whereby the handrail belt 64 can be driven.

Although, during the above-mentioned operation, the meshing between the belt 78 and the chain 53 is not partially effected due to the presence of the eliminated teeth 79, there is no possibility that the meshing state disappears entirely since the double-toothed belt 79 usually engages with the footstep chain 53 through several teeth (of the involute gear 77) existing in the straight traveling section, as mentioned above.

Note, also in the third embodiment, owing to the provision of the guide plate 81 on the opposite side of the double-toothed belt 78 over the footstep chain 53, it can be prevented from escaping from the belt 78, whereby the more reliable engagement can be ensured therebetween.

Finally, it will be understood by those skilled in the art that the foregoing descriptions are related to some preferred embodiments of the handrail driving apparatus of the invention, and that various changes and modifications may be made to the present invention without departing from the spirit and scope thereof.



What is claimed is:

1. A handrail driving apparatus for a man-conveyer which includes a plurality of axles each having a footstep fixed thereon and at least one wheel rotatably supported on each of the axles for guiding the traveling of the footstep, the footsteps being arranged in series, and at least one footstep chain arranged on one side the successive footsteps, the footstep chain consisting of numerous links successively connected with each other in an endless manner for fixing and allowing the axles to penetrate every footsteps, the handrail driving apparatus comprising, at least one side of the man-conveyer;

a handrail driving sprocket adapted so as to mesh with the footstep chain on one side of the man-conveyer for driving the footstep chain, the handrail driving sprocket having a plurality of teeth of which number is an odd number of times as many as the number of links corresponding to one footstep, provided that, among the teeth, one or more teeth positioned corresponding to the axles are eliminated so as not to interfere with the axles;

a second sprocket arranged in coaxial with the handrail driving sprocket so as to rotate integrally therewith;

a handrail driving chain wound around the second sprocket; and
a handrail driven by the handrail driving chain.

2. The handrail driving apparatus as claimed in claim 1, further comprising a pair of guide rails for guiding the footsteps passing through the handrail driving sprocket, one of the guide rails being arranged on a forward path side of the traveling footsteps while the other being arranged on a return path side of the traveling footsteps,

wherein the shortest distance between the guide rails is substantially equal to the diameter of a pitch circle of the handrail driving sprocket.

3. The handrail driving apparatus as claimed in claim 2, wherein at least the guide rail on the forward path side is arranged so that an inside end thereof directing the handrail driving sprocket occupies the exterior of an outer sidewall of the handrail driving sprocket.



4. The handrail driving apparatus as claimed in claim 1, further comprising at least one guide plate which is arranged on the opposite side of the handrail drive sprocket beyond the footstep chain, for preventing it from disengaging from the handrail drive sprocket .

5. A handrail driving apparatus for a man-conveyer which includes a plurality of axles each having a footstep fixed thereon and at least one wheel rotatably supported on each of the axles for guiding the traveling of the footstep, the footsteps being arranged in series, and at least one footstep chain arranged on one side the successive footsteps, the footstep chain consisting of numerous links successively connected with each other in an endless manner for fixing and allowing the axles to penetrate every footsteps, the handrail driving apparatus comprising, at least one side of the man-conveyer;

plural groups of:

one handrail driving sprocket adapted so as to mesh with the footstep chain on one side of the man-conveyer for driving the footstep chain, the handrail driving sprocket having a plurality of teeth of which number is an odd number of times as many as the number of links corresponding to one footstep, provided that, among the teeth, one or more teeth positioned corresponding to the axles are eliminated so as not to interfere with the axles;

one second sprocket arranged in coaxial with the handrail driving sprocket so as to rotate integrally therewith; and

one handrail driving chain wound around the second sprocket; and

a handrail driven by the handrail driving chain in each one of the groups;

wherein a distance between respective centers of the adjoining handrail driving sprockets is established so as to prevent constituents of the plural groups from interfering with each other and is an odd number of times as long as one half of every pitch of the footsteps.

6. A handrail driving apparatus for a man-conveyer which includes a plurality of axles each having a footstep fixed thereon and at least one wheel rotatably supported on each of the axles for guiding the traveling of

the footstep, the footsteps being arranged in series, and at least one footstep chain arranged on one side the successive footsteps, the footstep chain consisting of numerous links successively connected with each other in an endless manner for fixing and allowing the axles to penetrate every footsteps, the handrail driving apparatus comprising, at least one side of the man-conveyer;

- a pair of toothed pulleys arranged in appropriate positions;

- an endless double-toothed belt provided, on one side thereof, with a plurality of teeth which mesh with the footstep chain and of which number is a whole number of times as many as the number of links corresponding to one footstep, provided that, among the teeth, one or more teeth positioned corresponding to the axles are eliminated so as not to interfere with the axles and also provided, on the other side, with a plurality of teeth which mesh with the toothed pulleys for their rotation;

- a second sprocket arranged in coaxial with one of the toothed pulleys so as to rotate integrally therewith;

- a handrail driving chain wound around the second sprocket; and

- a handrail driven by the handrail driving chain.

7. The handrail driving apparatus as claimed in claim 6, further comprising one guide plate which is arranged on the opposite side of the endless double-toothed belt beyond the footstep chain, for preventing it from disengaging from the endless double-toothed belt.