

BELT CURVE CONVEYOR

FIELD OF THE INVENTION

5 The present invention relates to a belt curve conveyor used for changing direction of transportation of objects, and more particularly, to a belt curve conveyor in which a fan-type belt is detachably mounted on a body thereof.

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BACKGROUND

 In general, a belt curve conveyor is utilized to change the transporting direction of a belt conveyor for carrying objects.

15 In order to prevent a belt from being caught or biased inside due to its tension, a marginal section is formed on the periphery of a fan-type belt in which a number of guide roller independently mounted on a guide bridge provided on the periphery of the belt in such a
20 manner that those guide rollers pinch the ledge so as to maintain the tension against the outside of the fan-type belt. As a result, such a belt can not be exchanged or replaced easily.

 This type of belt conveyor is replaced when
25 necessity arises. In particular, when food or pharmaceuticals are transported, a belt is removed and cleaned on a regular basis to keep the whole conveyor line

clean. For this purpose, a conventional belt in which a set of two guide rollers mounted vertically on upper and lower lines to prevent the belt from being biased by supporting a thick part (projection) of the belt end, 5 which allows the belt to be replaced easily, is common.

One example is shown in Japanese patent unexamined publication No.2002-114343 (page 4, left column, line 33 to page 5, right column, line 31, and figs. 1 and 4). A cam is mounted on the upper part of an operation lever in 10 which the lever is rotated in such a manner that the upper cam comes into a contact with a frame face as its first cam face changes to its second cam face so that an arm securing a guide roller on each side thereof is energized by a spring to spread in a suitable manner, and is 15 extruded from the guide member to protrude forward so as to spread the arm so that the guide rollers come out from the thickest part (projection) of the belt end, which enables the belt to be replaced.

20 PROBLEMS TO BE SOLVED BY THE INVENTION

However, in a conventional belt curve conveyor, each of the guide rollers is secured to a fixed holder by a bolt engaged onto an inner surface of the guide roller through a bearing. When a belt is attached or removed, 25 the fixed holder must be partially removed so as to remove both the guide rollers and the engaging bolt. As a result, a tool is required to remove a part of the fixed

holder and remove the guide rollers with their engaging bolt. In addition, as the holder, rollers, and bolts are dismantled, it necessitates some time and labor to reinstall a fan-shaped belt after it has been disassembled
5 and cleaned.

Furthermore, as shown in the prior art disclosed in the aforementioned publication, the thickest part of the belt end can be released by an operation lever to release guide rollers, which allows the belt to be pulled out on
10 the internal diameter side. However, the energizing force to the extending direction of the upper and lower arms is weakened by being stored in the guide members for a long time so that it does not extend well when being protruded forward by the operation lever; as a result the
15 thickest part (projection) of the belt end is caught by the lower guide roller as the belt sags down when it is pulled out to the fan shape on the internal diameter side, which eventually necessitates disassembly and removal of the guide rollers. As a further result, a tool
20 is required to disassemble and remove a part of the fixed holder so as to remove the guide rollers and their engaging bolt, and to assemble them again. In addition, as the holder, rollers, and bolts are dismantled, it requires a certain amount of time and labor to reinstall a
25 fan-shaped belt after it has been disassembled and cleaned.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a belt curve conveyor in which a guide wheel provided inside of the belt rotates 90 degrees sequentially by the operation of a lock handle, which allows the belt to be removed easily.

In order to achieve the above object, a belt curve conveyor defined in claim comprises a number of guide wheel units mounted on a belt profile (circumferential part, peripheral part) of a fan-type belt so as to pinch the belt end, wherein a semicircular edge is formed on both front and rear surfaces of the peripheral part of the belt so as to abut a guide wheel. Said guide wheel units are composed of a first guide wheel and a fourth guide wheel abutting the outside face edge of a forward side belt (carrier side belt) and a return side belt, and of a second guide wheel and a third guide wheel abutting the inside face of a forward side belt and return side belt; said first guide wheel and fourth guide wheel are supported by a supporting piece equipped with a spring plate or a cushion rubber fixed above and below the horizontal edge of a holder secured to an outer peripheral part of a base, and said second guide wheel and third guide wheel are supported by a supporting piece equipped with a spring plate or a cushion rubber fixed to the upper and lower edges of a rotation axis bracket secured to the inner center of the holder in a

rotatable manner; a lock part provided inside of the rotation axis provided at the center of the holder, and a keyhole formed at the outside end surface of the rotation axis so as to be engaged with a key part arranged at the end of a detachable lock handle so that the second guide wheel and the third guide wheel become separated from the inner surface of the belt in such a manner to insert the lock handle and rotate the rotation axis by 90 degrees, which enables the belt to be removed.

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MODE FOR CARRYING OUT THE INVENTION

According to the present invention, the first guide roller abutting a top surface of a carrier side belt, and the fourth guide roller abutting a bottom surface of a return side belt are arranged as a pair to be fixed to a bracket through a supporting piece having a flat spring or a cushion rubber, while the second guide roller abutting the bottom surface of a carrier side belt, and the third guide roller abutting the top surface of a return side belt are arranged as a pair to be fixed to a bracket through a supporting piece having a flat spring or a cushion rubber so as to be provided between the belt carrier side and the return side in a rotatable manner. When a belt is replaced, this pair of guide rollers (the second and third guide rollers) are rotated by 90 degrees so that they are separated from the thickest part of the belt end, which allows the belt to be replaced.

Conventionally, breakage and stripping of a belt profile (circumferential part, peripheral part) are the primary causes of trouble in a belt curve conveyor. In this invention, breakage of a belt is prevented by
5 employing a spring plate for a guide wheel (spring guide holder) for pressing such a belt profile part so that it can be supported with a constant suppressing force while providing a protrusion in the vicinity of the belt profile part on the belt side, and a skirt from the frame side to
10 form a trap in the clearance gap so that a tag can be prevented from being caught, which allows normal operation to be maintained.

In general, when a belt is replaced, all guide wheels, chain, motor, and inner frame must be removed,
15 which, for instance, takes approximately two hours if three people work together. Thus, maintenance is inefficient. Further, adjusting the contact between a guide wheel and the belt profile to be equal depends on a person's experience. If there is only one spot where
20 a guide wheel contacts excessively, it will cause breakage of a belt profile or a strip, which results in decreased reliability. On the other hand, according to the invention, the time for replacing a belt can be vastly shortened by releasing a belt presser in such a
25 manner that a removable lock handle is inserted sequentially into a lock integrated in an axis of a guide holder so as to rotate the holder by 90 degrees.

That is, the aforementioned release mechanism of the guide wheel makes it possible to release the belt easily while maintaining a big clearance, so that it takes approximately 30 minutes to replace a belt by combining a
5 belt release function which is performed by a take-up mechanism of a cephalo caudal roller such as a drive roller; thus the maintainability is improved. As a guide roller rotates 90 degrees without using the engagement of a thread, it simply rotates in the same
10 position. Thus, when the belt is remounted after cleaning, the guide roller is just rotated in the opposite direction so as to reproduce the original position, which improves the assembly efficiency. In addition, to employ a hollow shaft motor which is a
15 chainless type motor as actuator of an end pulley, low noise operation can be achieved.

According to the present invention, the first guide roller abutting the top surface of a carrier side belt, and the fourth guide roller abutting the bottom
20 surface of a return side belt are arranged as a pair to be fixed to a bracket through a supporting piece having a flat spring or a cushion rubber, while the second guide roller abutting the bottom surface of a carrier side belt, and the third guide roller abutting the top surface
25 of a return side belt are arranged as a pair to be fixed to a bracket through a supporting piece having a flat spring or a cushion rubber so as to be provided between

the belt carrier side and the return side in a rotatable manner. When a belt is replaced, this pair of guide rollers (the second and third guide rollers) is rotated by 90 degrees so that they are separated from the thickest
5 part of the belt end, which allows the belt to be replaced.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plane view of a belt curve conveyor of
10 the present invention.

Fig. 2 is a partially enlarged plane view of Fig. 1.

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

Fig. 4 is a plane view viewing in the arrow
15 direction from the B-B line of Fig. 3.

Fig. 5 is a plane view viewing in the arrow direction from the C-C line of Fig. 3.

Fig. 6 is a further enlarged sectional view along the D-D line of Fig. 2.

20 Fig. 7 is a side view of Fig. 6.

Fig. 8 is a plane view viewing in the arrow direction from the E-E line of Fig. 6.

Fig. 9 is an enlarged sectional view of a guide wheel.

25 Fig. 10 is an enlarged side view showing another embodiment of the guide wheel.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, the preferred embodiments of the invention are explained referring to drawings. Fig. 1 is a plane view of a belt curve conveyor of the present invention, Fig. 2 is a partially enlarged plane view of Fig. 1., Fig. 3 is an enlarged sectional view along the A-A line of Fig. 2., and Fig. 4 is a plane view in the arrow direction from the B-B line of Fig. 3, respectively.

In a curve belt conveyor 1, there are provided a fan-type belt 10 stretched over between end pulleys 3, 4 of both ends, and a number of guide wheel units 50 arranged on the outer periphery of the belt support a thickness end part 38 (Fig. 6) of the outer periphery of the curve belt so as to prevent the curve belt from moving to a fan shape internal diameter so that the curve belt conveyor travels in such a manner to provide tension against the outside of the belt. The main part of the conveyor is supported by cross members 5, 5 close to end pulleys 3, 4, and a leg unit 7 provided on a cross angle 6 of the plane center of the fan-shape part. A torque arm 18 is fixed to the end of a cross member 5 mounted on the large diameter axis end of the driving side end pulley 3 using a bolt 19. Then, a drive unit 15 composed of a motor (hollow shaft motor) 16 and a reduction gear 17 is mounted to the torque arm 18.

In the drawings, reference numerals 8, 9 denote side plates, numeral 11 is a base, numeral 12 is a base plate (Fig. 6), numeral 12a is a support, numeral 13 is

an outer cover, numeral 13a is a skirt, numeral 14 is a guide rail, numeral 21 is a pulley shaft, numeral 22 is a pulley bracket of small diameter side, numeral 22a is a pulley bracket of the large diameter side, numerals 22, 23 are a bearing members, numerals 25, 26 are spherical bearings, and numeral 27 is an end cap. Reference numeral 22b denotes an adjusting thread, and numeral 22c is an adjusting plate.

As shown in Figs. 3 and 6, a semicircular edge 38, 38 is formed on the top and bottom face of the peripheral part (belt profile 20) of the belt 10 in such a manner to abut a guide wheel of a guide wheel unit 50. This edge 38, 38 is formed on the end of a continuous side 38a surrounding the belt edge.

Protrusion of a belt is normally provided at a position separated a certain distance from the periphery of the belt and formed in a section of rectangular or trapezoidal shape. However, if it meanders, the raised corner of the protrusion of the section of rectangular or trapezoidal shape pinched by the guide wheels is torn off. In the present invention, the edge has a round shape to prevent jamming and being torn. As there is a clearance of 3 - 5 mm between the belt and the outer cover (a skirt 13a of the outer cover), to prevent involution stoppage and breakage resulting from a tag caught in this clearance, a protrusion 39 (Fig. 6) is provided on the top surface of the belt at the position separated a

certain distance from the edge 38 to fill the clearance, which functions as a means of preventing tag jamming.

Each guide wheel unit 50 is composed of a first guide wheel and a fourth guide wheel 52a, 52d abutting the
5 outside face edge of a forward side belt and a return side belt, and of a second guide wheel and a third guide wheel 52b, 52c abutting the inside face of a forward side belt and return side belt (Fig. 6). Each of the first guide wheel and fourth guide wheel 52a, 52d is supported
10 by a spring plate 47, 47 fixed to an upper and lower horizontal edge 42, 43 of a holder 40 secured to a peripheral part of the base, while each of the second and third guide wheels 52b, 52c is supported by a spring plate 47, 47 fixed to the upper and lower edges of a
15 rotation axis bracket 45 secured to the inner center of the holder 40 in a rotatable manner. A lock part is provided inside of the rotation axis 44 at the center of the holder 40, and a keyhole 61 is formed at the outside end surface of the rotation axis 44 so as to be engaged
20 into a key part 63 arranged at the end of a detachable lock handle 62 so that the belt can be removed in such a manner that the second and the third guide wheels 52b, 52c are separated from the inner surface of the belt as shown by the chain line of Fig. 8 by inserting the lock
25 handle and rotating the rotation axis 44 by 90 degrees (Fig. 7).

Fig. 5 is a plane view in the arrow direction from

the C-C line of Fig. 3. A small diameter side pulley bracket 22 of an end pulley is secured into a side plate 9 by a bolt in such a manner to support a bearing member 24 through a slide 28. A square hole 29 is provided at one
5 of a bearing member 24 so as to be engaged with the head 33 of the screw bar 31 of a take up unit 30. The square hole 29 includes a notch 34 having a front opening. The screw bar 31 is inserted into a bracket 32 provided on a side plate 9 so as to be engaged with a nut 35 of the
10 notch 34 side, the nuts 36, 37 abutting both surfaces of the bracket 32 so that the bearing member 24 can obtain the most appropriate belt tension.

As disclosed in Japanese patent unexamined publication H9-67960 and H9-100657, a detachable lock
15 handle device comprises a lock part having a case providing a key hole at front, a passive protrusion provided at the front circumferential part, a rotor having a salient locking axis on a rear face, a cover plate provided at the rear part of the rotor, a rotor guide, a
20 bearing ring provided in the case, a spring for the cover plate, and a lock handle having a key in the diameter direction of the handle tip, which is an operational part. A detachable lock handle used in the invention comprises a crucial keyhole having four notches in the periphery of a
25 hole 61 90 degrees apart (Fig. 7), and four projections at the tip of the lock handle 62 corresponding to the notches so that the 90 degree rotation of the handle is

secured.

As shown in Fig. 8, the second guide wheel and the third guide wheel 52b, 52c are rotated by 90 degrees to become separated from the inner surface of the belt by the
5 lock handle operation. Then, the fitting bolt of the small diameter side pulley bracket 22 of the aforementioned end pulley is loosened to slide the bearing member 24 outward, which allows the belt to be removed.

Fig. 9 is an enlarged sectional view of a guide
10 wheel 50. This guide wheel 50 is provided in such a manner that a shoulder bolt 51 is engaged with the inside peripheral face of a wheel (bearing) 52 so as to mount a spring plate 47 through a ring 56, while a thread part 53 extended from one of the shoulder bolts penetrates an
15 opening of the spring plate 47 to be secured with a nut 55.

Fig. 10 is an enlarged side view showing another embodiment of the guide wheel. In this case, the guide wheels 52a, 52b, 52c, and 52d are mounted with a cushion
20 rubber (cushioning material) 58 provided at the tip of a standard steel plate instead of a spring plate (spring). That is, a supporting piece 57 of standard steel (for instance, SS41) bent in an obtuse angle shape is mounted on the upper and lower horizontal edges 42, 43 of the
25 holder 40, and on the bracket 45 so that the tip of each supporting piece 57 pinches the cushion rubber 58 so as to penetrate each shoulder bolt 51 of the guide wheels 52a,

52b, 52c, and 52d, to be fastened by a nut 55. However, the lower horizontal edge 43 and guide wheel 52d are not shown in Fig. 10. As apparent from this explanation, the guide wheels 52 abut semicircular edges 38, 38 through the elasticity of the cushion rubber 58, which provides tension against the belt.

As explained above, a belt curve conveyor of the invention employs a supporting piece having a spring plate or a cushion rubber for pressing a belt profile part so as to support the belt with a constant suppressing force so that breakage can be prevented, and employs a handle type holder so that the time for replacing a belt can be vastly shortened. In addition, a spring type guide wheel can prevent a tag from being caught. Further, the one-touch belt replacement mechanism can improve the maintainability and efficiency of the assembly.

CLAIMS:

1. A belt curve conveyor comprises a number of guide wheel units mounted on an outer peripheral part of a fan-type belt so as to pinch a belt end,

5 wherein a semicircular edge is formed on both front and rear surface of the peripheral part of the belt so as to abut a guide wheel,

said guide wheel units are composed of a first guide wheel and a fourth guide wheel abutting the outside face edge of the forward side belt and the return side belt,
10 and of a second guide wheel and a third guide wheel abutting the inside face of the forward side belt and return side belt;

said first guide wheel and fourth guide wheel are supported by a supporting piece equipped with a spring plate or a cushion rubber fixed to the upper and lower horizontal edges of a holder secured to an outer peripheral part of a base, and said second guide wheel and third guide wheel are supported by a supporting piece
15 equipped with a spring plate or a cushion rubber fixed to the upper and lower edges of a rotation axis bracket secured to the inner center of the holder in a rotatable manner;

a lock part provided inside of the rotation axis at the center of the holder, and a keyhole formed at the outside end surface of the rotation axis so as to be engaged with a key at the end of a detachable lock handle
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so that the second guide wheel and the third guide wheel become separated from the inner surface of the belt in such a manner to insert the lock handle and rotate the rotation axis by 90 degrees, which enables the belt to be
5 removed.