

SORTING DEVICE AND SLAT

[Technical Field]

[0001]

The present invention relates to a sorting device for sorting articles and a slat used in the sorting device.

[Background Art]

[0002]

Conventionally, a sorting device disclosed in Patent Literature 1, for example, is known.

[0003]

The conventional sorting device includes a conveying means having a plurality of slats for conveying articles in a conveying direction, for example. A pushing member that pushes the articles onto a branch conveying means from the slat to sort the articles is provided in each slat of the conveying means so as to be slidable in a direction crossing a conveying direction.

[Prior Art Document]

[Patent Document]

[0004]

[Patent Document 1]: Japanese laid-Open Patent Publication No. 2002-274638

[Summary of the Invention]

[Problem to be Solved by the Invention]

[0005]

In this type of sorting device, it is important that articles are sorted appropriately when the pushing member slides in relation to the slats during conveying by the conveying means.

[0006]

The present invention has been made in view of the above and an object thereof is to provide a sorting device and a slat capable of sorting articles appropriately.

[Means for Solving the Problems]

[0007]

A slat described in claim 1 is a slat used in a sorting device including a conveying means having a plurality of slats for conveying articles, and a plurality of pushing members that pushes and sorts the articles by sliding in relation to a slat of the conveying means, the slat including: a body portion having a plurality of tubular parts and a connecting part that connects the plurality of tubular parts to each other; a mounting portion which is provided in the body portion and on which an article is mounted; and a guiding portion that is provided on each of the plurality of tubular parts of the body portion in a projecting manner so as to guide the pushing member.

[0008]

A slat described in claim 2 is the slat described in claim 1, in which the guiding portion includes: a guiding plate part that has a circular arc shape in a cross-sectional view and guides the pushing member; and a connecting part that protrudes from the tubular part of the body portion, and the guiding plate part is connected to the tubular part by the connecting part.

[0009]

A slat described in claim 3 is the slat described in claim 1 or 2, in which the guiding portion makes contact with a lower surface and a side surface of a guided surface of the pushing member.

[0010]

A slat described in claim 4 is the slat described in any one of claims 1 to 3, in which the mounting portion is an oblong mounting plate, the mounting plate has both lateral end parts that engage with the pushing member to restrict upward and downward rotation of the pushing member in relation to the slat, and the end part is thicker than the other portion of the mounting plate, a thickness thereof decreases gradually as it advances from a base end side toward a distal end side, and a distal end of the end part has a curved upper surface.

[0011]

A slat described in claim 5 is the slat described in any one of claims 1 to 4, in which the body portion includes: a planar part which is erected on each of the plurality of tubular parts and of which the upper end is connected to the mounting portion; and a curved plate-shaped connecting part that connects the plurality of tubular parts to each other, the connecting part has two circular arc-shaped portions and a flat plate-shaped portion that connects these circular arc-shaped portions to each other, the circular arc-shaped portion extends obliquely upward from each lateral end part of the flat plate-shaped portion, and an upper end of each circular arc-shaped portion is connected to an upper portion of the tubular part.

[0012]

A slat according to claim 6 is a slat used in a sorting device including a conveying means having a plurality of slats for conveying articles, and a plurality of pushing members that pushes and sorts the articles by sliding in relation to a slat of the conveying means, the slat including: a body portion having a plurality of tubular parts; a mounting portion which is provided in the body portion and on which an article is mounted; and a guiding portion that is provided on each of the tubular parts

of the body portion in a projecting manner so as to guide the pushing member, and the guiding portion has a plurality of guiding plate parts having a circular arc shape in a cross-sectional view, which are arranged in parallel at intervals on an imaginary circle so as to guide the pushing member.

[0013]

A sorting device described in claim 7 includes a conveying means including a plurality of the slats described in any one of claims 1 to 6; and a plurality of pushing members that pushes and sorts articles by sliding in relation to the slat of the conveying means.

[0014]

A sorting device described in claim 8 is the sorting device described in claim 7, in which the conveying means includes: a rotatable endless member having a plurality of spindles; and a connector which is fitted to an end of a tubular part of the body portion of the slat and to which the spindle is inserted.

[Effects of the Invention]

[0015]

According to the present invention, the slat includes the body portion having a plurality of tubular parts, the mounting portion which is provided in the body portion and on which an article is mounted; and a guiding portion that is provided on each of the plurality of tubular parts of the body portion in a projecting manner so as to guide the pushing member. Therefore, it is possible to sort articles appropriately.

[BRIEF DESCRIPTION OF THE DRAWINGS]

[0016]

Fig. 1 is a plan view of a sorting device according to

an embodiment of the present invention.

Fig. 2 is a plan view of a portion of the sorting device.

Fig. 3 is a perspective view illustrating a slat (conveyer slat) of the sorting device.

Fig. 4 is a side view of the slat.

Figs. 5(a) to 5(c) are diagrams for describing rotation of a pushing member (shoe) of the sorting device.

Fig. 6 is a cross-sectional view of a mold for manufacturing the slat.

Fig. 7 is a view illustrating a first modification of the slat.

Fig. 8 is a view illustrating a second modification of the slat.

Fig. 9 is a view illustrating a third modification of the slat.

Fig. 10 is a view illustrating a fourth modification of the slat.

Fig. 11 is a view illustrating a fifth modification of the slat.

Figs. 12(a) to 12(e) are diagrams for describing the shape of a guiding portion of the slat.

[Mode for Carrying Out the Invention]

[0017]

An embodiment of the present invention will be described with reference to Figs. 1 to 6.

[0018]

In the drawings, reference numeral 1 designates a sorting device, and the sorting device 1 is a slide shoe-type conveying sorting device that conveys and sorts articles W based on sorting information during the conveying.

[0019]

The sorting device 1 includes a conveying means 3 that has a plurality of slats 2 for carrying articles W on an upper surface and conveying the articles W in a conveying direction A and a plurality of pushing members (shoes) 5 that push the articles W onto a branch conveying means 4 which is a branch unit from the slat 2 to sort the articles W by sliding in relation to the slat 2 in a direction crossing (for example, perpendicular to) the conveying direction A of the conveying means 3.

[0020]

The plurality of slats 2 are arranged in parallel along the conveying direction A in an adjacent state, and each pushing member 5 can slide in relation to the slats 2 in a left-right direction (the direction perpendicular to the conveying direction A) and can rotate in an up-down direction in a state of being sandwiched between both adjacent slats 2.

[0021]

The conveying means 3 includes a pair of two left and right rotatable chains 11 which are endless members that are separated from each other and face each other. The chains 11 are stretched across a plurality of sprockets (not illustrated) which are a plurality of rotating members and rotate in a predetermined direction based on power supplied from a motor 12 which is a driving means.

[0022]

The chain 11 includes an endless chain body 13 that includes an outer link, an inner link, and the like. A plurality of spindles 14 positioned at equal intervals in a rotating direction is provided in the chain body 13 so as to protrude toward an inner side (toward the slat 2). A roller 15 that travels while rotating on a guide rail (not illustrated) during rotation of

the chain 11 is provided on a base end-side outer circumference of each spindle 14 so as to be rotatable. The chain 11 is covered with a cover 17 of a frame 16 of the conveying means 3.

[0023]

A plurality of slats 2 which is a conveying member that are oblong in the left-right direction and convey the article W while moving in the conveying direction A based on rotation of the chain 11 is provided between both chains 11 of the conveying means 3.

[0024]

Here, as can be seen in Figs. 2 and 3, each end in the longitudinal direction (the direction perpendicular to the conveying direction A) of each slat 2 is connected to the chain 11 with only a plurality of (for example, two) circular cylindrical bushes 21 which are connectors and are formed of a synthetic resin, interposed. That is, the chain 11 and the slat 2 are connected to each other via only the bush (one type of component) 21, which is a cylindrical member, interposed.

[0025]

The bush (pin bush) 21 has a cylindrical portion 22 of which both end surfaces are open, and a ring-shaped positioning blade portion 23 is integrated with and protrudes from an axial intermediate portion of an outer circumferential surface of the cylindrical portion 22. Moreover, a fitting hole 24 is formed on an inner side of the cylindrical portion 22, and the spindle (pin) 14 of the chain 11 is rotatably fitted and inserted into the fitting hole 24.

[0026]

On the other hand, the pushing member 5 has a sandwiched portion 31 that is positioned between front and rear slats 2 that are adjacent to each other in the conveying direction A

and is sandwiched by both slats 2. A circular arc-shaped surface 32 that faces the upper side and has a shape in a cross-section corresponding to 1/4 of a circle (including an approximately quarter-circular shape) is formed on the front and rear surfaces of the sandwiched portion 31.

[0027]

Moreover, a pushing portion 33 that makes contact with a side surface of an article W loaded on the slat 2 to push the article W onto the branch conveying means 4 from the slat 2 is provided above the sandwiched portion 31. A guided portion 34 that is guided by a guiding means 37 is provided below the sandwiched portion 31, and the guided portion 34 includes a bearing 35, a pin 36, and the like.

[0028]

The guiding means 37 includes a straight guide rail 38 that guides the guided portion 34 of the pushing member 5 along the conveying direction A and a branch guide rail 39 that guides the guided portion 34 of the pushing member 5 in a direction oblique to the conveying direction A to allow the pushing member 5 to slide in relation to the slat 2 in a direction crossing (perpendicular to) the conveying direction A (see Fig. 1).

[0029]

Moreover, a switching means (not illustrated) that selectively switches between the guided portion 34 of the pushing member 5 moving straight toward the straight guide rail 38 side or moving toward the branch guide rail 39 side is arranged on the upstream side of a guiding start end of the branch guide rail 39. The switching means includes a rotation guide member that guides the guided portion 34, for example, a driving member (a rotary solenoid) that rotates the rotation guide member based on sorting information, and the like.

[0030]

Here, as illustrated in Figs. 3 and 4, the slat 2 includes a body portion 41 having a plurality of (two, for example) front and rear circular tubular parts 40 that are oblong in the left-right direction, and are separated from each other and face each other, a rectangular mounting plate 42 which is a mounting portion which is provided integrally on an upper portion of the body portion 41 and is oblong in the left-right direction, on which the article W is mounted on the upper surface, and a projection-shaped guiding portion 43 that is oblong in the left-right direction and is integrated with an outer circumferential surface of each tubular part 40 of the body portion 41 so as to protrude outward so as to guide the pushing member 5 during sliding and rotation of the pushing member 5 in relation to the slat 2.

[0031]

That is, each slat 2 is a long and thin object formed integrally by extruding metal such as aluminum, for example, and includes the body portion 41, the mounting plate 42, and the guiding portion 43.

[0032]

The mounting plate 42 has a configuration in which both lateral end parts that engage with the pushing member 5 to restrict upward and downward rotation of the pushing member 5 in relation to the slat 2 have a larger thickness than the other portion (an intermediate portion excluding both lateral end parts).

[0033]

That is, the mounting plate 42 includes a rectangular plate-shaped mounting plate body part 46 that is oblong in the left-right direction and a rotation restricting end part 47 that is connected to both lateral end parts of the mounting plate

body part 46 and is thicker than the thin mounting plate body part 46.

[0034]

The thickness of the mounting plate body part 46 is approximately constant over the entire mounting plate body part 46 and is smaller than the thickness of the rotation restricting end part 47. On the other hand, the thickness of the rotation restricting end part 47 decreases gradually as it advances from a base end side to a distal end side and the distal end of the rotation restricting end part 47 has a curved upper surface.

[0035]

Moreover, although an upper surface of the lateral end part of the mounting plate body part 46 and the upper surface of the rotation restricting end part 47 are smoothly continuous to each other without any step, a step 48 is formed between a lower surface of the lateral end part of the mounting plate body part 46 and a lower surface of the rotation restricting end part 47.

[0036]

Further, the mounting plate body part 46 has two circular arc-shaped portions 46a that have an upwardly projecting semicircular shape (including an approximately semicircular shape) in a cross-sectional view and make contact with a lower surface of the article W. These circular arc-shaped portions 46a are connected to each other by a curved connecting plate 46b.

[0037]

The pushing member 5 performs operations illustrated in Figs. 5(a) to 5(c) with respect to the slat 2. Fig. 5(a) illustrates a state in which the slat 2 reaches the sprocket (when the moving direction is changed) and advances toward a

carrier side or a return side; Fig. 5(b) illustrates a state in which the slat 2 advances in the conveying direction or in a direction opposite to the conveying direction on the return side; and Fig. 5(c) illustrates a state in which the slat 2 passes through a return-side catenary (when the moving direction is changed).

[0038]

In Fig. 5(a), the rotation restricting end part 47 of the mounting plate 42 of the slat 2 makes contact and engages with the pushing portion 33 of the pushing member 5 and makes contact with the guiding portion 43 whereby rotation of the pushing member 5 in relation to the slat 2 is restricted.

[0039]

In Fig. 5(b) the rotation restricting end part 47 of the mounting plate 42 of the slat 2 makes contact and engages with the sandwiched portion 31 of the pushing member 5 and makes contact with the pushing portion 33 of the circular arc-shaped portion 46a, and the guiding portion 43 and the sandwiched portion 31 make contact with each other, whereby the positioning of the pushing member 5 is realized. Further, the pushing member 5 which is a shoe makes contact with a guiding plate part 55 when sliding in the left-right direction, whereby inclination (rattling) of the pushing member 5 is prevented.

[0040]

In Fig. 5(c), the rotation restricting end part 47 of the mounting plate 42 of the slat 2 makes contact and engages with a receiving portion of the sandwiched portion 31 of the pushing member 5, the circular arc-shaped portion 46a makes contact with the pushing portion 33, and the guiding portion 43 makes contact with the sandwiched portion 31, whereby rotation of the pushing member 5 in relation to the slat 2 is restricted.

[0041]

The body portion 41 which is a base portion includes a plurality of (for example, two) circular tubular parts 40 of which both end surfaces are open and the axial direction extends in a direction crossing the conveying direction A and which are parallel to each other, a curved plate-shaped connecting part 51 that connects these two tubular parts 40, and a flat plate-shaped planar part 52 which is erected on an upper end of each tubular part 40 and of which the upper end is connected to a lower surface of the circular arc-shaped portion 46a of the mounting plate body part 46 of the mounting plate 42.

[0042]

The tubular part 40 is formed in a perfect circular shape of which the center is on a horizontal central axis line (axial center) X and is positioned so as to extend from one longitudinal end of the slat 2 to the other longitudinal end. The cylindrical portion 22 of the bush 21 is inserted and fitted into an inner circumferential side of each axial end of the tubular part 40, and the blade portion 23 makes contact with an end surface of the tubular part 40, whereby the positioning of the bush 21 in relation to the tubular part 40 is realized. Moreover, the spindle 14 of the chain 11 is fitted and inserted into the fitting hole 24 of the positioned bush 21 so as to be rotatable. In this way, the plurality of slats 2 are connected to the chain 11 with only a plurality of (for example, four) bushes 21 interposed. That is, the slat 2 is provided between both chains 11 with the bush 21 only interposed.

[0043]

The connecting part 51 has two circular arc-shaped portions 51a having a shape in a cross-sectional view corresponding to 1/4 of a circle (including an approximately quarter-circular

shape) and these circular arc-shaped portions 51a are connected by a flat plate-shaped portion 51b. The flat plate-shaped portion 51b is positioned on a side further up than a horizontal line L that connects two central axis lines X. The circular arc-shaped portion 51a extends obliquely upward from each lateral end part of the flat plate-shaped portion 51b, and an upper end of each circular arc-shaped portion 51a is connected to an upper portion of the tubular part 40.

[0044]

The plurality of guiding plate parts 55 of each guiding portion 43 is configured to guide sliding and rotation of the pushing member 5 in relation to the slat 2. That is, when the pushing member 5 slides in relation to the slat 2, the pushing member 5 slides in a left-right direction perpendicular to the conveying direction A in relation to the slat 2 while being guided by the guiding portion 43 and the circular arc-shaped portion 46a of the mounting plate 42. Moreover, when the pushing member 5 rotates in relation to the slat 2, the pushing member 5 rotates and slides in relation to the slat 2 about the central axis line X of the tubular part 40 while being guided by the guiding portion 43.

[0045]

Moreover, each guiding portion 43 includes a plurality of (for example, two) guiding plate parts 55 that have a circular arc shape in a cross-sectional view and that are arranged in parallel at intervals on an imaginary circle having the center on the central axis line X of the tubular part 40 of the body portion 41 so as to guide the pushing member 5. A central portion in a circular arc direction (width direction) of each guiding plate part 55 is connected to an outer circumferential surface of the tubular part 40 by a flat plate-shaped connecting part

56 that extends in a radial direction of the tubular part 40.
[0046]

That is, one of the two guiding plate parts 55 is formed in a distal end of the connecting part 56 that protrudes from the lower end of the tubular part 40 and is positioned on a lower side of the tubular part 40. Moreover, the other of the two guiding plate parts 55 is formed in a distal end of the connecting part 56 that protrudes from the outer end of the tubular part 40 and is positioned on an outer side of the tubular part 40. Both guiding plate parts 55 make sliding surface-contact with the circular arc-shaped surface 32 of the sandwiched portion 31 of the pushing member 5. A central angle of the circular arc of the circular arc-shaped guiding plate part 55 is approximately 60°, for example and is smaller than a central angle of the circular arc of the of the circular arc-shaped surface 32 of the sandwiched portion 31.

[0047]

Next, the operation and the like of the sorting device 1 will be described.

[0048]

When an article W is supplied onto the conveying means 3, the article W is mounted on the mounting plate 42 of the slat 2 being moved in the conveying direction A and is conveyed in the conveying direction A.

[0049]

Here, when the article W is not to be sorted and conveyed onto the branch conveying means 4, the article W is conveyed in the conveying direction A as it is on the slat 2 without being pushed by the pushing member 5.

[0050]

On the other hand, when the article W is to be sorted and

conveyed onto the branch conveying means 4, the article W is pushed in a direction crossing the conveying direction A by the pushing member 5 that slides in relation to the slat 2 in the longitudinal direction of the slat 2 and is sorted and conveyed onto the branch conveying means 4 from the slat 2.

[0051]

According to the sorting device 1, the pushing member 5 slides in relation to the slat 2 in the direction crossing the conveying direction A, whereby articles W that are to be sorted can be sorted appropriately.

[0052]

Moreover, the mounting plate 42 of the slat 2 has the rotation restricting end part 47 which engages with the pushing member 5 to restrict rotation of the pushing member 5 in relation to the slat 2 about the central axis line X and which is formed thicker than the mounting plate body part 46. Thus, it is possible to restrict rotation of the pushing member 5 appropriately with the aid of the rotation restricting end part 47 and to suppress vibration of the pushing member 5.

[0053]

Further, the guiding portion 43 of the slat 2 has the plurality of guiding plate parts 55 that have a circular arc shape in a cross-sectional view and that are arranged in parallel at intervals on an imaginary circle having the center on the central axis line X. Thus, it is possible to allow the pushing member 5 to rotate smoothly in relation to the slat 2 about the central axis line X.

[0054]

Moreover, an approximately entire portion (a portion of the slat 2 other than the rotation restricting end part 47, for example) of the slat 2 is thin (that is, a plate thickness thereof

is formed as small as 1.5 mm, for example). Thus, each slat 2 is light and it is possible to reduce weight easily.

[0055]

Further, the slat 2 and the chain 11 are connected to each other with only the inexpensive bush 21 interposed. Thus, an assembling operation is easy and it is possible to reduce the manufacturing cost.

[0056]

Moreover, since the body portion 41 of the slat 2 has the plurality of tubular parts 40, the slat 2 has a desired level of rigidity or more although it is thin, and inconveniences such as deformation of the slat 2 can be appropriately prevented.

[0057]

Further, the body portion 41 of the slat 2 has the curved plate-shaped connecting part 51 that connects the plurality of tubular parts 40 to each other. Thus, the body portion 41 has stronger rigidity than a configuration in which both circular tubular parts 40 are connected by a flat plate-shaped connecting part, for example, and the precision of the circle of the tubular part 40 is satisfactory.

[0058]

For example, Fig. 6 is a cross-sectional view of a mold for manufacturing the slat 2 by extruding metal such as aluminum. In this drawing, reference numeral 60 designates a fixed mold that is fixed to a container in which a metal raw material is filled; reference numeral 61 designates a first core; and reference numeral 62 designates a second core.

[0059]

A portion of the circular tubular part 40 formed by the gap (a portion hatched by vertical lines in Fig. 6) between the fixed mold 60 and the first core 61 has high precision because

a metal raw material is stably extruded from the gap a.

[0060]

On the other hand, a portion of the circular tubular part 40 formed by the gap (a portion hatched by horizontal lines in Fig. 6) b between the first core 61 and the second core 62 does not have satisfactorily high precision because a metal raw material is not stably extruded from the gap b.

[0061]

Thus, by lengthening the gap a and shortening the gap b, it is possible to improve overall precision of the circle of the tubular part 40 in which the gaps a and b are combined.

[0062]

Therefore, the connecting part 51 of the body portion 41 of the slat 2 has a curved plate shape that includes the circular arc-shaped portions 51a on both lateral end parts that are curved upward and the flat plate-shaped portion 51b between these circular arc-shaped portions 51a. As a result, the precision of the circle of the circular tubular parts 40 is satisfactory.

[0063]

The slat 2 is not limited to the shape illustrated in Fig. 4 but may have the shapes illustrated in Figs. 7 to 11, for example.

[0064]

In the slat 2 illustrated in Fig. 7, the tubular part 40 of the body portion 41 has a polygonal cylindrical shape (for example, a quadrangular cylindrical shape). For example, the tubular part 40 may have an elliptical cylindrical shape.

[0065]

In the slat 2 illustrated in Fig. 8, each guiding portion 43 does not have the guiding plate part 55 having a circular arc shape in a cross-sectional view but has a guiding part 71 having a square shape in a cross-sectional view. The

cross-sectional shape of the guiding part 71 may be oblong or circular, for example.

[0066]

In the slat 2 illustrated in Fig. 9, the tubular part 40 of the body portion 41 has a discontinuous cylindrical shape having a plurality of notches arranged in the circumferential direction. Moreover, the guiding portion 43 formed in each tubular part 40 so as to protrude includes a guiding part 72 having a C-shape in a cross-sectional view. The cross-sectional shape of the guiding part 72 may be U-shaped or V-shaped, for example. Moreover, the guiding part 72 may be formed on the outer circumferential surface of a continuous tubular part 40 so as to protrude, for example.

[0067]

In the slat 2 illustrated in Fig. 10, each guiding portion 43 has one guiding plate part 55 having a semicircular shape (including an approximately semicircular shape) in a cross-sectional view.

[0068]

In the slat 2 illustrated in Fig. 11, each guiding portion 43 has a plurality of (for example, two) guiding plate parts 55 having a circular arc shape in a cross-sectional view, and the ends in the circular arc direction of each guiding plate part 55 are connected to the tubular part 40 by the connecting part 56. The connecting part 56 may not be planar but may have a triangular shape in a cross-sectional view.

[0069]

Moreover, for example, in order to improve the rigidity, the entire mounting plate 42 of the slat 2 may be formed relatively thick, and the thick mounting plate 42 may be integrated with an upper end of the tubular part 40 of the body portion 41.

[0070]

Further, the connecting part 51 of the body portion 41 is not limited to the configuration in which the connecting part 51 is positioned on the upper side of the line L; the flat plate-shaped portion 51b of the connecting part 51 may be positioned on the lower side of the line L.

[0071]

Moreover, the circular arc-shaped portion 51a may extend obliquely downward from the lateral end part of the flat plate-shaped portion 51b of the connecting part 51, for example. Further, an inclined portion instead of the circular arc-shaped portion 51a may extend so as to be connected to an upper portion of the tubular part 40, for example.

[0072]

Figs. 12(a) to 12(e) are diagrams for describing the shape of the guiding portion (guiding member) 43 of the slat 2.

[0073]

As illustrated in Fig. 12(a), as a principle, the guiding portion 43 of the slat 2 is to be supported by making contact with the lower and side surfaces of the circular arc-shaped surface 32 (guided surface) of the pushing member 5.

[0074]

The hatched portions illustrated in Figs. 12(b) and 12(c) are regions that are needed to make contact with the pushing member 5 during normal and reverse rotation (upward and downward rotation). The angle α in Fig. 12(b) is approximately 23° , for example, and the angle β in Fig. 12(c) is approximately 5° , for example.

[0075]

When both hatched portions are combined, at least the hatched portions illustrated in Fig. 12(d) are required.

[0076]

Thus, a small margin in the longitudinal direction is provided to the hatched portions illustrated in Fig. 12(d) to obtain the guiding portion 43 illustrated in Fig. 12(e). Since the guiding portion 43 has two guiding plate parts 55 having a predetermined length, it is possible to prevent floating, sinking, and rattling of the pushing member 5 appropriately.

[0077]

While several embodiments of the present invention and modifications thereof have been described, the respective embodiments and modifications may be combined appropriately without departing from the spirit of the present invention.

[Description of the Reference Numerals]

[0078]

- 1: Sorting device
- 2: Slat
- 3: Conveying means
- 5: Pushing member
- 11: Chain as endless member
- 14: Spindle
- 21: Bush as connector
- 32: Circular arc-shaped surface as guided surface
- 40: Tubular part
- 41: Body portion
- 42: Mounting plate as mounting portion
- 43: Guiding portion
- 51: Connecting part
- 51a: Circular arc-shaped portion
- 51b: Flat plate-shaped portion
- 52: Planar part

55: Guiding plate part

56: Connecting part

W: Article

WHAT IS CLAIMED IS:

1. A slat used in a sorting device including a conveying means having a plurality of slats for conveying articles and a plurality of pushing members that push and sort the articles by sliding in relation to a slat of the conveying means, the slat comprising:

a body portion having a plurality of tubular parts and a connecting part that connects the plurality of tubular parts to each other;

a mounting portion which is provided in the body portion and on which an article is mounted; and

a guiding portion that is provided on each of the plurality of tubular parts of the body portion in a protruding manner so as to guide the pushing member.

2. The slat according to claim 1, wherein the guiding portion includes:

a guiding plate part that has a circular arc shape in a cross-sectional view and guides the pushing member; and

a connecting part that protrudes from the tubular part of the body portion, and

the guiding plate part is connected to the tubular part by the connecting part.

3. The slat according to claim 1 or 2, wherein

the guiding portion makes contact with a lower surface and a side surface of a guided surface of the pushing member.

4. The slat according to any one of claims 1 to 3, wherein the mounting portion is an oblong mounting plate, the mounting plate has both lateral end parts that engage

with the pushing member to restrict upward and downward rotation of the pushing member in relation to the slat, and

the end parts are thicker than the other portion of the mounting plate, a thickness thereof decreases gradually as it advances from a base end side toward a distal end side, and a distal end of the end part has a curved upper surface.

5. The slat according to any one of claims 1 to 4, wherein the body portion includes:

a planar part which is erected on each of the plurality of tubular parts and of which the upper end is connected to the mounting portion; and

a curved plate-shaped connecting part that connects the plurality of tubular parts,

the connecting part has two circular arc-shaped portions and a flat plate-shaped portion that connects these circular arc-shaped portions,

the circular arc-shaped portions extend obliquely upward from each lateral end part of the flat plate-shaped portion, and an upper end of each circular arc-shaped portion is connected to an upper portion of the tubular part.

6. A slat used in a sorting device including a conveying means having a plurality of slats for conveying articles and a plurality of pushing members that push and sort the articles by sliding in relation to a slat of the conveying means, the slat comprising:

a body portion having a plurality of tubular parts;

a mounting portion which is provided in the body portion and on which an article is mounted; and

a guiding portion that is provided on each of the tubular parts of the body portion in a protruding manner so as to guide

the pushing member, and

the guiding portion has a plurality of guiding plate parts having a circular arc shape in a cross-sectional view, which are arranged in parallel at intervals on an imaginary circle so as to guide the pushing member.

7. A sorting device comprising:

a conveying means including a plurality of the slats according to any one of claims 1 to 6; and

a plurality of pushing members that push and sort articles by sliding in relation to the slat of the conveying means.

8. The sorting device according to claim 7, wherein

the conveying means includes:

a rotatable endless member having a plurality of spindles;

and

a connector which is fitted to an end of a tubular part of the body portion of the slat and to which the spindle is inserted.