

PATENT SPECIFICATION

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(54) HANGING DEVICE FOR BAR MATERIALS

(71) We, YOSHIDA KOGYO K. K., of No. 1 Kanda Izumi-cho, Chiyoda-ku, Tokyo, Japan, a Corporation duly organised under the laws of Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a hanging device for bar materials to be subjected to surface treatment, e.g. coating by electrodeposition on to extruded bars of aluminum and the like.

In the surface treatment of various bar materials carried out by dipping the bars into a liquid in a treatment tank, the materials are hung either vertically or horizontally with corresponding types of hanging devices. Horizontal type hanging devices are in general unsatisfactory because of complexity in the chucking and dipping operations as well as the difficulty in obtaining uniform surface treatment. Therefore the current prevalence is the vertical type hanging devices provided at certain intervals to the underside of a conveyor body along the direction of transportation.

For example, a typical hanging device as disclosed in Japanese Utility Model Disclosure 50—149626 has several chuck units fixed to the conveyor body, each of the chuck units serving for chucking a bar material. A major problem in such a device is the lack of versatility for gripping bar materials with varied size and cross-section.

Another problem in such types of prior art hanging devices is the difficulty in automatization of the chucking operation, especially, when the bar materials have various irregular cross sections necessitating manual manipulation of the bar materials to be chucked and also when the bar must be located in only one place on hanging devices, leading to low working efficiency.

According to the invention there is provided a hanging device for transportation of a bar material with a conveyor which comprises

(a) a base plate member having a vertical surface and secured to the body of the conveyor,

(b) a horizontal support pivot means having its axis extending horizontally in the direction substantially parallel to the vertical surface, and

(c) a chuck unit composed of a plurality of gripper members pivotally supported on the horizontal support pivot means, each of the gripper members being closely adjacent the neighbouring ones and rotatable around the horizontal axis independently from the others, whereby the upper end of the bar material is chucked between the vertical surface and the edge surfaces of the gripper members facing to the vertical surface of the vertical base plate member.

The invention will be described by way of example with reference to the accompanying drawings, wherein:—

Fig. 1 is a schematic side view of a preferred hanging device embodying the present invention with a bar material hung by the device and dipped in a treatment liquid;

Fig. 2 is an enlarged side view of the hanging device of Fig. 1 with a bar material chucked by the gripper members;

Fig. 3 is a cross-sectional side view of the device shown in Fig. 2 with a bar material chucked by the gripper members, as cut along the line I—I in Fig. 4;

Fig. 4 is a cross-sectional plan view of the same device with a bar material as shown in Fig. 3, as sectioned along the line II—II in Fig. 3;

Fig. 5 is a perspective view of the device fixed to the conveyor body (several of the gripper members are omitted in the middle) together with a bar material to be chucked below; and

Figs. 6 and 7 are plan views of the device similar to Fig. 4 with bar materials of complicated cross-sections chucked by 14 or 13 of the gripper members, respectively.

The preferred design of the hanging device of the present invention will now be described with reference to the drawings.

In the figures, 2 is a vertical base plate member connected to the underside of the conveyor body 1. At a distance from the surface of the vertical base plate member 2 is

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provided a chuck unit 3 having gripper members 5 with arcuate surfaces 6 facing the vertical surface of the base plate member 2.

The chuck unit 3 is composed of a plurality of gripper members 5 supported pivotally by the horizontal axis 4 parallel to the vertical surface of the base plate member 2, each of the gripper members 5 being close to the neighbouring ones but still rotatable around the axis 4 independently each from the others. The gripper members 5 are shaped in a form like a hook as shown in Fig. 2 or 3 and the edge surface 6 facing the vertical base plate member 2 is curved in an arcuate form convex toward the vertical base plate member 2. The arcuate surfaces 6 of the gripper members 5 may have a plurality of pointed teeth 7 with their tips directed somewhat upwardly. The gripper members 5 are connected to the springs 8 exerting pulling force to the gripper members 5 in such a direction that the arcuate surfaces 6 of the gripper members 5 are biased adjacent the surface of the vertical base plate member 2. The arcuate surfaces 6 of the gripper members 5 are in contact with the vertical base plate member 2 when no bar material is chucked between the gripper members 5 and the vertical base plate member 2.

When a bar material 10 is to be chucked by the hanging device, the vertical base plate member 2 is first inserted into the slot 11 provided at the upper end of the bar material 10 whereby the gripper members 5 are rotated clockwise by being pushed by the bar material 10 counteracting the pulling force exerted by the springs 8 around the horizontal axis 4 so that the bar material 10 becomes chucked between the arcuate edge surfaces 6 with the pointed teeth 7 of the gripper members 5, and the surface of the vertical base plate member 2.

In response to the downward movement of the bar material 10 by gravity and frictional contact thereof with the members 5, the members 5 rotate around the horizontal axis 4 in the direction such that the pointed teeth 7 increasingly bite at the surface of the bar material 10 so that the bar material 10 is held against the surface of the vertical base plate member 2 and on the teeth 7, whereby falling of the bar material 10 is effectively prevented.

As to the thickness of the individual gripper members, it should be of course determined in consideration of the cross-section of the bar materials to be hung by the hanging device but it is usually 5 to 10 mm. The number of the gripper members in a chuck unit depends on the length of the vertical base plate member and the thickness of the gripper members. For example, about 600 gripper members with a thickness of 10 mm each are provided for a vertical base plate member of 6 meters long. It is optional that a lubricant is provided between the gripper member to ensure the

independent rotation of the individual gripper members from the neighboring ones.

When the bar materials have been chucked in the manner as described above, the conveyor body begins to move toward the tank filled with the treatment liquid into which the bar materials are dipped and surface-treated. After completion of the surface treatment of the bar materials by dipping in a treatment tank, the conveyor body further moves to the end of the treatment room where the bar materials are dismounted from the hanging device by releasing the pushing pressure of the gripper members exerted by the pulling force of the springs 8. Such a releasing action of the pushing pressure of the gripper members is conveniently effected by use of a pushing piston installed at the end of the conveyor line and which exerts a pushing force at the corner of the gripper members in the direction to counteract the pulling force of the spring 8 as shown by the arrows 9 in Figs. 2 and 3. By this rotation of the gripper members (clockwise in Figs. 2 and 3), the bar materials are easily released from the gripper members and freely drop to be further transported.

It is an alternative that the arcuate edge surface 6 of the gripper members 5 is provided with roughness instead of teeth 7. Similarly, the slot 11 in the bar material 10 is unnecessary when the width of the bar material 10 is relatively small, such that the entire bar will fit between the vertical plate 2 and members 5.

The hanging device of the drawings is, as described above, constructed with a set of vertical base plate members rigidly fixed to the underside of a conveyor body in the direction perpendicular to the running direction of the conveyor and a chuck unit at a distance from the vertical base member composed of a plurality of gripper members each close to the neighboring ones and capable of rotating pivotally around a horizontal axis parallel to the surface of the vertical base plate member, each independently from the others, so that the chucking of bar materials of any cross-sections can be ensured between the gripper members and the vertical base plate members.

The independent rotation of the individual gripper members is effective in reliably chucking any bar materials with irregular cross section owing to the fitting of the individual gripper members to the surface of the bar material.

The hanging device of the drawings is advantageous in saving man power by automating the hanging work of bar materials because the bar materials may be chucked at any position along the direction of the vertical base plate members regardless of the cross-section of the bar material.

The pointed teeth provided on the edge surfaces of the gripper members are effective for firmly chucking bar materials of any cross

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section with arcuate contour of the tips of the teeth.

5 The hanging device of the drawings is also advantageous in view of its simple, easy to manufacture, and durable structure.

Preferably, electric conduction is possible between the body of the conveyor and the base plate member or the chuck unit.

WHAT WE CLAIM IS:—

10 1. A hanging device for transportation of a bar material with a conveyor which comprises (a) a base plate member having a vertical surface and secured to the body of the conveyor,

15 (b) a horizontal support pivot means having its axis extending horizontally in the direction substantially parallel to the vertical surface, and

20 (c) a chuck unit composed of a plurality of gripper members pivotally supported on the horizontal support pivot means, each of the gripper members being closely adjacent the neighboring ones and rotatable around the horizontal axis independently from the others, whereby the upper end of the bar material is 25 chucked between the vertical surface and the edge surfaces of the gripper members facing to the vertical surface of the vertical base plate member.

30 2. A hanging device as claimed in claim 1

wherein the edge surfaces of the gripper members facing the vertical surface of the base plate member are provided with a plurality of pointed teeth, the contour formed by the tips of the teeth being an arcuate curved line convex toward the vertical surface of the base plate member. 35

3. A hanging device as claimed in claim 1 or 2 wherein the edge surface of the gripper members facing the vertical surface are arcuate curved surfaces convex toward the vertical surface and are provided with roughness to ensure frictional supporting of the bar material. 40

4. A hanging device as claimed in claim 1 wherein each of the gripper members is connected to a spring means providing a pulling force acting to move the gripper member in the direction to increase the press contact between the vertical surface and the edge surface of the gripper member facing thereto. 45 50

5. A hanging device as claimed in claim 1, 2, 3 or 4 wherein electric conduction is possible between the body of the conveyor and the base plate member or the chuck unit. 55

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The hanging device of the drawings is also advantageous in view of its simple, easy to manufacture, and durable structure.

Preferably, electric conduction is possible between the body of the conveyor and the base plate member or the chuck unit.

WHAT WE CLAIM IS:—

1. A hanging device for transportation of a bar material with a conveyor which comprises
 - (a) a base plate member having a vertical surface and secured to the body of the conveyor,
 - (b) a horizontal support pivot means having its axis extending horizontally in the direction substantially parallel to the vertical surface, and
 - (c) a chuck unit composed of a plurality of gripper members pivotally supported on the horizontal support pivot means, each of the gripper members being closely adjacent the neighboring ones and rotatable around the horizontal axis independently from the others, whereby the upper end of the bar material is chucked between the vertical surface and the edge surfaces of the gripper members facing to the vertical surface of the vertical base plate member.

2. A hanging device as claimed in claim 1

wherein the edge surfaces of the gripper members facing the vertical surface of the base plate member are provided with a plurality of pointed teeth, the contour formed by the tips of the teeth being an arcuate curved line convex toward the vertical surface of the base plate member.

3. A hanging device as claimed in claim 1 or 2 wherein the edge surface of the gripper members facing the vertical surface are arcuate curved surfaces convex toward the vertical surface and are provided with roughness to ensure frictional supporting of the bar material.

4. A hanging device as claimed in claim 1 wherein each of the gripper members is connected to a spring means providing a pulling force acting to move the gripper member in the direction to increase the press contact between the vertical surface and the edge surface of the gripper member facing thereto.

5. A hanging device as claimed in claim 1, 2, 3 or 4 wherein electric conduction is possible between the body of the conveyor and the base plate member or the chuck unit.

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