

A BALL JOINT FOR CABLE GUIDE

BACKGROUND OF THE INVENTION1. Field of the Invention

The present invention relates to a ball joint for use of various industrial appliances, in particular, for use of a cable guide.

2. Description of the Related Art

Conventionally, a ball joint for cable guide is structured as shown in Fig. 4. Reference numeral 1 designates a ball joint and 2 designates a cable and the ball joint 1 is interposed between a cable fixation table 3 for fixing one end of the cable and a cable supporting table 4 for supporting an intermediate portion of the cable and changing the drawn out direction approximately at 90 degrees. The ball joint 1 comprises a U-letter shaped retainer 5, a shaft 6 bridged between a pair of erected pieces 5a of U-letter shaped retainer, a cubic body 7 coupled rotatably with the shaft 6, an outer ring 8 to be coupled with the cubic surface of the cubic body 7, wherein the retainer 5 is mounted on a mounting plate 9 with a bolt 10 connected to the bottom of the leg portions 3a of the cable fixation table 3 with bolt 9, on the other hand, the outer ring 8 is mounted on one end 4a of the supporting table 4 with bolt 11.

In operation, the cable 2 is drawn downward approximately vertically from the cable fixation table 3, then make wound two or three times in loop on the cable supporting table 4, further drawn out approximately horizontal direction through a ring guide 12 on the cable supporting table 4. In the above mentioned ball joint 1, its cubic body 7 rotates against shaft 6 and the outer ring 8 also rotates against the cubic body 7, so that the cable supporting table 4 can swing three-dimensionally, which guarantees the cable 2 to move free.

By the way, according to the above mentioned cable

guide system, if the cable 2 is not wound in a loop on the cable supporting table 4, in case the cable supporting table 4 is swung greatly, an excessive tension is put on the cable 2, or the cable 2 is forced to be bent at a sharp angle, so that it has become an unavoidable condition to wind in loop on the cable supporting table 4.

However, there has been a problem in which, when the cable 2 is wound in loop on the cable supporting table 4, in accordance with the swinging of the cable supporting table 4 the cable 2 is apt to be damaged or due to a friction contact between the cable and the cable supporting table. In addition, due to a three-dimensional swinging of the cable supporting table 4, the cable 2 has been apt to be twisted at the looped portion, so that a lead in the cable is threatened to be broken.

Summary of the Invention

The present invention has been made to solve the above problem and is to provide a ball joint for guiding a cable which guarantees a smooth movement of the cable, thereby contributes greatly to increase the endurance of the cable.

To attain the above object, in the present invention, a ball joint comprises a ball and an outer ring to couple with the cubic surface of the ball, which is supported by a stationary retainer, said ball is pierced with a cable insertion hole which has an widened portion toward opening like a horn as a guide hole, in communication with which a guide member for guiding a cable inserted in this insertion hole is provided adjacently to the ball.

In the ball joint for cable guide thus constructed, by guiding a cable through the ball under the outer ring and inside the guide member which is in communication with the ball, the free movement of the cable is guaranteed because the ball and the guide member follow the movement of the cable in unitary manner, in addition, since the cable is

guided along the inside and horn-like face of the guide member, it can be prevented from being bent at a sharp angle or twisted.

In the present invention, a hollow shaft having screw at its tip end can be inserted in the cable insertion hole of the ball and connected by being screwed in the guide member, thereby those are made in a unit, and the hollow portion of the hollow shaft can be used as a cable guide path.

Also the retainer is configured as a bottomed box and it is positioned upside-down, and at the top where the outer ring supporting member is disposed and on the side of the retainer an outlet is provided for taking out the cable drawn out from the guide member. In this case, by engaging the guide member with the side of the retainer, a turning angle of the cubic body can be limited.

Brief Explanation of the Drawings

Fig. 1 is a sectional view showing the structure of the ball joint for cable guide of the present invention.

Fig. 2 is an exploded and sectional view showing the ball joint.

Fig. 3 is a sectional view of the operational structure of the ball joint.

Fig. 4 is a side view showing the structure and the using manner of the conventional ball joint for cable guide.

Detailed Description of Preferred Embodiment

Hereinafter, an embodiment of the present invention will be explained based on the attached drawings.

Figs. 1 - 3, show a ball joint for cable guide as an embodiment of the present invention. In these figures, reference numeral 20 designates a bottomed box shaped retainer. It is positioned on the stand 21 in an upside-down manner and fixed thereon by making use of a flange 22 provided around an opening peripheral of the box with bolts. The upside-down bottom 20a of the box is shaped conical, and at the tip of the conical shape a recessed portion (an outer

ring supporting portion) 24 for supporting the outer ring 23 to be coupled spherically with the cubic surface of the cubic body 22 is provided. The recessed portion 24 is formed as large as enough to accommodate completely the outer ring 23, and the outer ring 23 is, in the state coupled with the recessed portion 24, clamped fixedly between the bottom of the recessed portion 24 and a holding plate 26 mounted on the retainer 20 with bolts 25. The cubic body 22 and the outer ring 23 are sub-assembled as becoming unitary, and in the state where the outer ring 23 is coupled with the recessed portion 24, one portion of the cubic body 22 is adapted to be exposed through openings 24a, 26a (Fig. 2) provided in the bottom of the recessed portion 24 and the holding plate 26.

On the outer circumference of the cubic body 22, a pair of flat portions 27, 28 parallel with each other are formed, and through these flat portions 27, 28 and the cubic body 22, a piercing hole (cable insertion hole) 29 is provided (Fig. 2). On the other hand, a conically shaped guide member 31 having inside a guide hole 30 which is widened outwardly like a horn and a stepped and hollow shaft 32 are provided in clamping the cubic body 22 in a unitary manner.

In more detail, the hollow shaft 32 comprises a large diameter portion 33 which is a little larger than the diameter of the piercing hole 29 and, by connecting thereto, a small diameter portion 34 having a diameter a little smaller than the pierced hole 29, the tip end of that small diameter portion 34 is formed with male screw portion 35. On the other hand, a connection portion of the guide member 31 to the cubic body 22 is formed with a female screw portion 36 which is screwed with the male screw portion 35, whereby, in the piercing hole 29 of the cubic body 22, the small diameter portion 34 is inserted and the male portion 35 of the member 31, the guide member 31 is lifted up until it abuts to the lower flat portion 27 of the cubic body 22 and the hollow

shaft 32 is descended until the stepped portion 37 between the large diameter portion 33 and the small diameter portion 34 of the hollow shaft 32 touch to the upper flat portion 28 of the cubic body 22, thereby, the guide member 31 and the hollow shaft 32 are rigidly assembled while clamping the cubic body 22 firmly in a unitary manner. For reference, a sign 38 designates a handle 40 for turning the hollow shaft 32 at the time of assembling.

Now, hollow shaft 32 has a diameter which is a little larger than the diameter of the cable 40. This hollow shaft 32, as described above, is extended to the inner side of the guide member 31 through the piercing hole 29 of the cubic body 22, accordingly, the cable 40 is enabled to be drawn out vertically through the hollow shaft 32, the cubic body 22 and the guide member 31. On the other hand, on one side wall of the retainer 20 an outlet 41 for taking out the cable 40 is provided, then the cable 40 drawn out downward from the guide member 31 is adapted to be drawn out horizontally making use of this outlet 41 while changing its drawn out direction approximately at 90 degrees. For reference, in this outlet 41 a bush 42 as a damper made of such as rubber or plastic is coupled.

In assembling the above ball joint, an assembly pre-assembled with the cubic body 22 and the outer ring 23 is coupled with the recessed portion 24 of the top of the retainer 20, subsequently the holding plate 26 is mounted on the top end of the retainer 20 with bolts 25 to fix the assembly in position. Next, the small diameter portion 34 of the hollow shaft 32 is inserted in the piercing hole 29 of the cubic body 22, and by screwing the male screw portion 35 of the top end of the small diameter portion 34 in the female portion 36 of the guide member 31, the guide member 31 and the hollow shaft 32 are united while clamping the cubic body 22, and thereby the assembly of the ball joint is finished. Hereinafter, the cable 40 is inserted in the hollow shaft 32

from the upper, drawn out down the guide member 31, bent along the inner surface (R face) of the guide hole 30 figured like horn and taken out horizontally from the cable outlet 41 of the retainer 20 by changing the drawn out direction at approximately 90 degrees from vertical direction.

In the ball joint structured as mentioned above, when an outer force is applied to the cable 40, the cubic body 22 rotates within the outer ring 23, thereby the guide member 31 and the hollow shaft 32 swing in a unitary manner and free movement of the cable 40 is guaranteed. Then, since the cable 40 is bent along the inner surface of the horn figured guide hole 30 of the guide member 31, the cable is never bent at an sharp angle or twisted, and thereby a damage of the cable 40 or of the leads inside the cable is in advance prevented. In this embodiment in particular, since the cable 40 is supported by the hollow shaft 32 also in the upper side of the cubic body 22, the cable 40 does not get in touch with the holding plate 26 around the cubic body 2 and the outer ring 23, and in addition, since the bush 42 made of a damping material is coupled with the outlet 41, the cable 40 is not hung thereon, and so that the cable 40 does not interfere with the other members to avoid in advance from being damaged. For reference, the bush 42 of the outlet 41 or cable 40 may be omitted, but in this case, it is to be considered to chamfer the edge (R face) of the outlet 41 for avoiding the cable 40 from being hung thereon.

On the other hand, when a large force is applied to the cable 40, the guide member 31 and the hollow shaft 32 are apt to swing, in this case however, as shown in Fig. 3, one portion 31a of the guide member 31 abuts to the inclined inner surface of the bottom 20a of the retainer 20, which prevents the cubic body 22 from an excessive rotation more than a given angle, that means to prevent the hollow shaft 32 from swinging over a given angle θ . Thereby, there is no risk where the hollow shaft 32 swings more than necessary to

abut to the holding plate 26, so that any damage of not only the outer ring 23 but also the hollow shaft 32 itself is in advance prevented from being damaged.

As mentioned above, according to the ball joint for cable guide of the present invention, it is guaranteed for the cable to move smoothly without setting it in loop, and a damage of the cable or the lead in the cable can be avoided in advance to improve the endurance of the cable outstandingly.



What is claimed is:

1. A ball joint for cable guide comprises a cubic body and an outer ring, wherein the outer ring is supported by a stationary retainer, a cable inserting hole is provided in the cubic body, a guide member, which has a horn like guiding hole being widened toward the tip end and guides the cable through the cable inserting hole along an inner surface of the guiding hole.

2. A ball joint for cable guide according to Claim 1, wherein a screw portion of a tip end of the hollow shaft inserted in the cable insertion hole is screwed in the guide member to make the cubic body, the guide member and the hollow shaft unified, and a hollow inside of the hollow shaft is used as a cable guiding path.

3. A ball joint for cable guide according to Claim 1 or 2, wherein the retainer is of a bottomed box shape, at a bottom portion of the box positioned upside-down an outer ring supporting portion is disposed and on a side wall of the retainer an outlet for taking out the cable drawn out from the guide member.

4. A ball joint for cable guide according to Claim 1 or 2, wherein the guide member engages with an inner side of the retainer to limit a turning angle of the cubic body.