

DISPLAY APPARATUS

This invention relates to display apparatus for use in shops, exhibition sites and so forth, wherein the said display apparatus is intended for flexible space design for exhibitions, by mounting interior structures such as shelves, exhibits and pictures on vertically strained wire ropes, both ends of which are retained by rails.

It is conventional to mount exhibits upon a wire rope hung in a room or exhibition site, the two ends of which are fixed to a ceiling or wall. It is required that the exhibits be fixed to the desired positions of the wire rope to obtain satisfactory exhibition results or space design results.

Amongst problems of the conventional method utilizing a hanging wire rope are: that the exhibits mounted to the wire rope are extremely hard to remove; that if the wire rope is buried in the ceiling and the floor by means of suitable fixtures, replacement of the exhibits is inconvenient; that the wire rope may not be in harmony with some decorations, resulting in an unattractive appearance; that the wire rope allows the exhibits

frequently to slip down to cause accidents, requiring special care; and that any change in exhibition mounting positions cannot be performed easily and quickly.

The present invention has as an object the alleviation of these problems by providing means enabling the exhibits to be slid along and to be fixed to the rope easily and quickly, and permitting them to be positioned and handled easily, so as to result in substantial improvements in work efficiency and to provide attractive harmony with the exhibits, high safety and wider applications.

According to the present invention there is provided display apparatus for the purpose of installing exhibits, wherein said display apparatus includes:

- a first rail for fixing to a wall, which rail includes a groove;

- a slider fitted into the said groove for free sliding therein;

- a gripper for a wire rope upon which wire rope exhibits are to be hung, which gripper is connected to the slider and comprises a hollow cylinder having an inner, tapered surface, a plurality of balls which are fitted into the said cylinder and can be brought into contact with the said tapered surface;

- a sleeve which includes an aperture hole for receiving the wire rope between the balls and which sleeve is located in said hollow cylinder for free sliding therein, an end of the said sleeve projecting out of said hollow cylinder; and

- a spring, one end of which is fixedly located and the other end of which urges the sleeve in a predetermined direction with respect to the hollow cylinder to bring the balls into contact with the tapered surface and thus grip the wire, the other end of

said wire rope being secured in a groove in a second rail by means of extensible seizing and supporting hook means, whereby in use the said wire rope may be installed between the said rails under tension by extension of the said hook means.

Embodiments of the display apparatus according to the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a side view of the display apparatus;

Fig. 2 is a front view of the display apparatus;

Fig. 3 is a sectional view of a fragment of the display apparatus;

Fig. 4 is a side view showing another embodiment of the display apparatus;

Fig. 5 is a front view of the same embodiment as Fig. 4.

Fig. 6 is an oblique view of the display apparatus in use;

Figs. 7 to 9 are longitudinal sections of intermediate grippers of the display apparatus.

Referring firstly to Figs. 1 to 3 of the drawings, a gripper 2 capable of holding the upper end of a wire rope W has a slider 1 which is a free-sliding fit in an upper rail A. A lower end of the wire rope W is held by

a gripper 9 which has the same type of holder for the wire rope as has the gripper 2. The gripper 9 is connected, via extensible material 8, to an extensible hook 7 which slides along a groove in a lower rail B.

The gripper 2 has a hollow interior with two openings, provided by coaxial and interlinked holes: the upper of which is a small-diameter opening and the lower of which is a large-diameter, threaded opening. The gripper 2 consists of a hollow cylinder 11 surrounding the lower hole and into which an internal cylinder 12 shorter than the thread of the lower hole and having a tapered surface 2_1 is screwed, so that an inner part of the hollow cylinder 11 remains free of the internal cylinder 12.

The gripper 2 also consists of a sleeve 5 adapted for free sliding in the axial direction in the hollow section formed by the hollow cylinder 11 and the internal cylinder 12. The upper side of the hollow cylinder 11 is provided with the projecting slider 1.

The said sleeve 5 is a hollow cylinder including a cone 13 fitting against the tapered surface 2_1 at the centre, and the hollow part of which cone is used as a hole 4 through which the wire rope W passes. The cone 13 has a ball-holding hole 14 linked to the guide hole

4, open to the cone exterior and arranged radially of the axis of hole 4, and holds balls 3, 3, 3. The sleeve 5 is mounted in the hollow cylinder 11 with a spring 6 such that the balls 3, 3, 3 are arrayed in mutual proximity, with the cylindrical portion of sleeve 5 projecting from the lower end of the hollow cylinder 11. The spring 6 is mounted between a step formed in the hollow cylinder 11 and a step formed by cone 13 in the sleeve 5. An upper portion of the sleeve 5 can be received by the small-diameter hole of the hollow cylinder in order to guide the sliding of the sleeve 5.

The gripper 9 has the same structure as the gripper 2, but is used upside down. The gripper 9 may utilise a slider 1 as described above or an extensible connector 10 as an alternative.

In order to provide extensible material 8 connected to the coupler 10, two tension springs are used in Figs. 1 to 3, whilst a turnbuckle 8_1 is used in Figs. 4 and 5. The lower end of the extensible material 8 is connected to the hook 7 which is fitted into the lower rail B and used as a slider to allow smooth sliding.

The rail A has a groove A_1 into which the slider is fitted for sliding, a projecting wall A_2 being used to provide a projection for fixing, and a concave groove

A_4 into which the cover A_3 is fitted, the rail A being intended for installation on a wall, maintaining an attractive appearance by being substantially completely covered with a said removable plastic cover A_3 except at the opening of the groove A_1 .

The rail B has the same structure as the rail A, but is used upside down.

An intermediate gripper 19 as shown in Figs. 6 to 9 can be installed on the wire rope W. The intermediate gripper 19 has a similar wire rope-holding structure 18 as the gripper 2. The wire rope-holding structure 18 consists of a hollow cylinder with the inner tapered surface which has multiple balls contacting the said tapered surface, a sleeve with a hole through which the wire rope is passed to the said balls and from which the rope projects out of the hollow cylinder, a spring, one end of which is fixed and which constantly biases the sleeve in a predetermined direction, and in addition, holders for a shelf 20 and panels.

Thus, one end of the wire rope W is inserted in the gripper 2 mounted on the horizontally installed rail A and is allowed to be held by the balls 3, 3, 3, while the other end of wire rope W is inserted into and held under tension by the gripper 9 of the rail B, also

installed horizontally.

In Figs. 1 to 3, if the wire rope W is held by the gripper 9 with slight tension and then the tension is released, the said wire rope is strained by the restoring force of the expansible material 8 of the tension spring, while in the embodiment shown in Figs. 4 and 5, the turnbuckle 8₁ is used to adjust the tension of the said wire rope. In this way, multiple wire ropes W, for example, are installed under tension, and the shelf 20 is installed between intermediate grippers 19 for functional and attractive use. The wire ropes W may be easily moved in the horizontal direction by using the rails A and B.

In the above examples, the lower part of the wire rope W is connected with the extensible material 8 via the gripper 9. It goes without saying that the same tension as that of these examples may be obtained by connecting the lower end of the wire rope directly with the extensible material 8.

In Figs. 4 and 5, the system may be installed upside down, and the wire rope W may be strained horizontally or obliquely to hold the exhibits. In addition, the slider 1, connector 10 and the hollow cylinder 11 may be formed or incorporated into one assembly for removable

convenience.

By means of the present invention, there is provided display apparatus which allows extremely easy and quick change in exhibition location and installation by using wire ropes which are installed in the vertical direction under tension and which are easily moved in the horizontal direction, in addition to providing high safety and convenience.

CLAIMS:

1. Display apparatus for the purpose of installing exhibits, wherein said display apparatus includes:

a first rail for fixing to a wall, which rail includes a groove;

a slider fitted into the said groove for free sliding therein;

a gripper for a wire rope upon which wire rope exhibits are to be hung, which gripper is connected to the slider and comprises a hollow cylinder having an inner, tapered surface, a plurality of balls which are fitted into the said cylinder and can be brought into contact with the said tapered surface;

a sleeve which includes an aperture hole for receiving the wire rope between the balls and which sleeve is located in said hollow cylinder for free sliding therein, an end of the said sleeve projecting out of said hollow cylinder; and

a spring, one end of which is fixedly located and the other end of which urges the sleeve in a predetermined direction with respect to the hollow cylinder to bring the balls into contact with the tapered surface and thus grip the wire, the other end of said wire rope being secured in a groove in a second rail by means of extensible seizing and supporting hook means, whereby in use the said wire rope may be installed between the said rails under tension by extension of the said hook means.



2. Display apparatus according to Claim 1, wherein the first rail comprises a projecting wall at its upper part, a groove at its lower part into which groove the said slider fits, and a concave groove on the rail front portion for receiving a longitudinally extending cover.

3. Display apparatus according to Claim 2, wherein the said first rail is in the form of a longitudinally extending extrusion.

4. Display apparatus according to Claim 1, 2 or 3, wherein the said seizing and supporting hook means comprises a second gripper for holding the wire rope in the said hook means and further comprises a second tension spring for placing the wire rope under tension.

5. Display apparatus according to Claim 1, 2 or 3 wherein the said seizing and supporting hook means comprises a second gripper for holding the wire rope in the said hook means and further comprises a turnbuckle for placing the wire rope under tension.

6. Display apparatus substantially as hereinbefore described with reference to any one of the embodiments shown in the accompanying drawings.

