

DESCRIPTION

TITLE OF INVENTION: CABLE COMPENSATOR FOR SLIDING ROLLER SHUTTER DOORS BASED ON A CYLINDRICAL CABLE REEL

TECHNICAL FIELD

[0001] The invention relates to the technical field of sliding roller shutter doors, and specifically to a cable compensator for sliding roller shutter doors based on a cylindrical cable reel.

BACKGROUND ART

[0002] In order to solve the problem that the sliding roller shutter door becomes slack due to the inconsistency between the pulling speed of the fabric of the sliding roller shutter door and the unwinding speed of the cable on the cable reel of the sliding roller shutter door, existing sliding roller shutter doors have been improved in terms of their cable reels and systems. The outer contour of the cable reel is designed into a conical structure, so that the winding speed of the fabric of the sliding roller shutter door is consistent with the unwinding speed of the cable, thereby maintaining the flatness of the fabric. However, this invention cannot meet the application needs of fabrics with different thicknesses.

[0003] The conical-structured cable reels have been under technical monopoly by foreign enterprises: the taper of the conical-structured cable reel depends on the thickness of the fabric wound on the vertical shaft; different thicknesses correspond to different tapers. How to make a single cable reel suitable for different fabrics has become a pain point of the conical-structured cable reels. Therefore, solving the industry's pain point, avoiding foreign patent monopolies, and addressing the problem of slack fabric in sliding roller shutter doors caused by the inconsistent speed between the fabric pulling speed of the sliding roller shutter door and the unwinding speed of the cable reel of the sliding roller shutter door have become urgent issues to be resolved in the domestic industry at present.

SUMMARY OF THE INVENTION

[0004] To overcome the above shortcomings, the purpose of the invention is to provide a cable compensator for sliding roller shutter doors based on a cylindrical cable reel, so as to solve the problem that the sliding roller shutter door becomes slack due to the inconsistency

between the pulling speed of the sliding roller shutter door and the unwinding speed of the cable reel of the sliding roller shutter door.

[0005] To solve the above technical problems, the technical solution adopted by the invention is as follows:

[0006] a cable compensator for a sliding roller shutter door based on a cylindrical cable reel includes a first cable compensation wheel, a second cable compensation wheel, a third cable compensation wheel, and a cylindrical cable reel; each of the first cable compensation wheel, the second cable compensation wheel, and the third cable compensation wheel is provided with a cable through hole; the cylindrical cable reel is used for winding a cable of the sliding roller shutter door; the cable on the cylindrical cable reel passes through the cable through hole on the first cable compensation wheel, the cable through hole on the second cable compensation wheel, and the cable through hole on the third cable compensation wheel in sequence, forming a tortuous broken line; the first cable compensation wheel and the third cable compensation wheel are respectively sleeved with a torsion spring A and a torsion spring B; one end of the torsion spring A is fixed on the first cable compensation wheel, and an other end of the torsion spring A is clamped into a clamping hole on one side of the second cable compensation wheel; one end of the torsion spring B is fixed on the third cable compensation wheel, and an other end of the torsion spring B is clamped into a clamping hole on an other side of the second cable compensation wheel.

[0007] Further, the cable compensator for a sliding roller shutter door based on a cylindrical cable reel further includes a base, the first cable compensation wheel, the second cable compensation wheel, and the third cable compensation wheel are arranged in a row and rotatably connected to the base.

[0008] Further, the first cable compensation wheel, the second cable compensation wheel, and the third cable compensation wheel are respectively provided with a first gear, a second gear, and a third gear; the first gear meshes with the second gear, and the second gear meshes with the third gear.

[0009] Further, the second cable compensation wheel is provided with a torsion spring force adjuster, which is used to adjust the elastic force of both torsion spring A and torsion spring B at the same time.

[0010] Further, the torsion spring force adjuster includes an elastic force adjustment post and a limit pin; the second cable compensation wheel is a tubular hollow structure; the elastic force adjustment post is arranged at a center of the second cable compensation wheel, and the elastic force adjustment post is connected to an inner wall of the second cable compensation wheel

through a plurality of connecting plates; an arc-shaped limit hole A is formed between adjacent connecting plates; the base is provided with limit holes B corresponding to the arc-shaped limit holes A; when the elastic force adjustment post is rotated, it drives the second cable compensation wheel to rotate by a preset angle; the second cable compensation wheel then drives the first cable compensation wheel and the third cable compensation wheel to rotate by a preset angle through the first gear, the second gear, and the third gear to adjust the elastic force of torsion spring A and torsion spring B; after that, the limit pin is inserted into the corresponding arc-shaped limit hole B and limit hole A; the limit pin is used to restrict the reverse rotation of the second cable compensation wheel; during cable compensation, when the second cable compensation wheel rotates in a forward direction, the limit pin slides in the arc-shaped limit hole B.

[0011] Further, the cable compensator for a sliding roller shutter door based on a cylindrical cable reel further includes a fourth cable compensation wheel, the fourth cable compensation wheel is provided with a cable through hole; the fourth cable compensation wheel is mounted on the base, and arranged in a row with the first cable compensation wheel, the second cable compensation wheel, and the third cable compensation wheel; the fourth cable compensation wheel is provided with a fourth gear, and the fourth gear meshes with the third gear; the cable of the sliding roller shutter door passes through the cable through hole on the fourth cable compensation wheel.

[0012] Further, the base is provided with a cable guide post, the cable guide post is provided with a horizontal hole; the cable of the sliding roller shutter door on the cylindrical cable reel passes through the horizontal hole on the cable guide post.

[0013] Further, the cable guide post is located on one side of the fourth cable compensation wheel and arranged in a row with the first cable compensation wheel, the second cable compensation wheel, the third cable compensation wheel, and the fourth cable compensation wheel.

[0014] Further, the elastic force adjustment post is a hexagonal prism structure, or an upper end surface of the elastic force adjustment post is provided with a hexagonal groove, and the hexagonal groove is used to match with a hexagonal wrench.

[0015] Further, an outer contour of the cylindrical cable reel is a cylindrical structure; a circumferential surface of the cylindrical structure is provided with a spiral cable groove; the spiral cable groove is used to accommodate the cable so that the cable is wound in an orderly manner on the cylindrical cable reel, thereby ensuring the stability of the cable tension; an end surface of the cylindrical structure is provided with a central hole, and an inner surface of the

central hole is provided with a friction damping gear ring; the friction damping gear ring is used to fit with a friction damping block to increase the frictional resistance of the cylindrical cable reel and prevent the cable from rotating relative to the roller shutter, which would cause cable tangling.

[0016] Beneficial effects of the present invention

[0017] After the invention is applied to a sliding roller shutter door based on a cylindrical cable reel, it can compensate for the cable of the sliding roller shutter door, thereby solving the problem that the sliding roller shutter door becomes slack due to the inconsistency between the pulling speed of the sliding roller shutter door and the unwinding speed of the cable reel of the sliding roller shutter door.

[0018] The invention is provided with a torsion spring force adjuster on the second cable compensation wheel, which can adjust the elastic force of torsion spring A and torsion spring B.

BRIEF DESCRIPTION OF ACCOMPANY DRAWINGS

[0019] The invention will be further described with reference to the accompanying drawings, but the embodiments in the accompanying drawings do not constitute any limitation to the invention. For those of ordinary skill in the art, other drawings can be obtained based on the following drawings without exerting creative labor:

[0020] FIG. 1 is a structural diagram of the invention;

[0021] FIG. 2 is a structural diagram of the second cable compensation wheel shown in FIG. 1;

[0022] FIG. 3 is a top view of the structure shown in FIG. 1;

[0023] FIG. 4 is a structural diagram of a bottom shell of the base shown in FIG. 1;

[0024] FIG. 5 is a three-dimensional view of the structure shown in FIG. 2;

[0025] FIG. 6 is a structural diagram of the invention after a top shell of the base is installed;

[0026] FIG. 7 is a schematic diagram of cable threading of the invention;

[0027] FIG. 8 is a structural diagram of the cylindrical cable reel shown in FIG. 1.

[0028] In the drawings: 1. first cable compensation wheel; 2. second cable compensation wheel; 3. third cable compensation wheel; 4. fourth cable compensation wheel; 5. base; 6. cable through hole; 7. torsion spring A; 8. torsion spring B; 9. cylindrical cable reel; 10. clamping hole; 11. first gear; 12. second gear; 13. third gear; 14. fourth gear; 15. cable guide post; 16. horizontal hole; 17. elastic force adjustment post; 18. connecting plate; 19. arc-shaped limit

hole A; 20. limit hole B; 21. hexagonal groove; 22. cable of the sliding roller shutter door; 23. spiral cable groove; 24. friction damping gear ring.

SPECIFIC EMBODIMENT OF THE INVENTION

[0029] In order to enable those skilled in the art to better understand the technical solution of the invention, the invention will be further described in detail below with reference to the accompanying drawings and specific embodiments. It should be noted that, in the case of no conflict, the embodiments of the present application and the features in the embodiments can be combined with each other.

[0030] In the description of the invention, it should be understood that the terms such as "center", "longitudinal", "transverse", "length", "width", "thickness", "upper surface", "lower surface", "front", "rear", "left", "right", "vertical", "horizontal", "top", "bottom", "inner", "outer" "forward rotation" "reverse rotation" "axial" "radial" "circumferential" indicate the orientation or positional relationship based on the orientation or positional relationship shown in the accompanying drawings. These terms are only for the convenience of describing the invention and simplifying the description, rather than indicating or implying that the device or element referred to must have a specific orientation, be constructed and operated in a specific orientation, and therefore cannot be understood as a limitation to the invention.

[0031] As shown in FIG. 1, FIG. 2, and FIG. 6, a cable compensator for a sliding roller shutter door based on a cylindrical cable reel includes a base 5, a first cable compensation wheel 1, a second cable compensation wheel 2, a third cable compensation wheel 3, a fourth cable compensation wheel 4, and a cylindrical cable reel 9; the cylindrical cable reel 9 is used for winding the cable of the sliding roller shutter door; each of the first cable compensation wheel 1, the second cable compensation wheel 2, the third cable compensation wheel 3, and the fourth cable compensation wheel 4 is provided with a cable through hole 6; the first cable compensation wheel 1 and the third cable compensation wheel 3 are respectively sleeved with a torsion spring A 7 and a torsion spring B 8; one end of the torsion spring A 7 is fixed on the first cable compensation wheel 1, and an other end of the torsion spring A 7 is clamped into a clamping hole 10 on one side of the second cable compensation wheel 2; one end of the torsion spring B 8 is fixed on the third cable compensation wheel 3, and an other end of the torsion spring B 8 is clamped into a clamping hole 10 on an other side of the second cable compensation wheel 2.

[0032] The first cable compensation wheel 1, the second cable compensation wheel 2, the third cable compensation wheel 3, and the fourth cable compensation wheel 4 are arranged in a row and rotatably connected to the base 5.

[0033] The first cable compensation wheel 1, the second cable compensation wheel 2, the third cable compensation wheel 3, and the fourth cable compensation wheel 4 are respectively provided with a first gear 11, a second gear 12, a third gear 13, and a fourth gear 14; the first gear 11 meshes with the second gear 12, the second gear 12 meshes with the third gear 13, and the third gear 13 meshes with the fourth gear 14.

[0034] The base 5 is provided with a cable guide post 15, the cable guide post 15 is located on one side of the fourth cable compensation wheel 4 and arranged in a row with the first cable compensation wheel 1, the second cable compensation wheel 2, the third cable compensation wheel 3, and the fourth cable compensation wheel 4; the cable guide post 15 is provided with a horizontal hole 16; a cable of the sliding roller shutter door 22 on the cylindrical cable reel 9 passes through the horizontal hole 16 on the cable guide post 15, the cable through hole on the fourth cable compensation wheel 4, the cable through hole on the third cable compensation wheel 3, the cable through hole on the second cable compensation wheel 2, and the cable through hole on the first cable compensation wheel 1 in sequence, forming a tortuous broken line. The schematic diagram of the cable threading is shown in FIG. 7.

[0035] As shown in FIG. 8, an outer contour of the cylindrical cable reel 9 is a cylindrical structure; a circumferential surface of the cylindrical structure is provided with a spiral cable groove 23. The spiral cable groove 23 is used to accommodate the cable so that the cable is wound in an orderly manner on the cylindrical cable reel, thereby ensuring the stability of the cable tension; an end surface of the cylindrical structure is provided with a central hole, and an inner surface of the central hole is provided with a friction damping gear ring 24. The friction damping gear ring 24 is used to fit with a friction damping block to increase the frictional resistance of the cylindrical cable reel 9 and prevent the cable from rotating relative to the roller shutter, which would cause cable tangling.

[0036] The second cable compensation wheel 2 is provided with a torsion spring force adjuster, which is used to adjust the elastic force of both torsion spring A 7 and torsion spring B 8 at the same time.

[0037] As shown in FIG. 3, FIG. 4, and FIG. 5, the torsion spring force adjuster includes an elastic force adjustment post 17 and a limit pin (not shown in the figure). The second cable compensation wheel 2 is a tubular hollow structure. The elastic force adjustment post 17 is arranged at a center of the second cable compensation wheel 2, and the elastic force adjustment post 17 is connected to an inner wall of the second cable compensation wheel 2 through a plurality of connecting plates 18; an arc-shaped limit hole A 19 is formed between adjacent connecting plates 18; the base 5 is provided with limit holes B 20 corresponding to the

arc-shaped limit holes A 19. When the elastic force adjustment post 17 is rotated, it drives the second cable compensation wheel 2 to rotate by a preset angle. The second cable compensation wheel 2 then drives the first cable compensation wheel 1 and the third cable compensation wheel 3 to rotate by a preset angle through the first gear 11, the second gear 12, and the third gear 13 to adjust the elastic force of torsion spring A 7 and torsion spring B 8. After that, the limit pin is inserted into the corresponding arc-shaped limit hole B 19 and limit hole A 20. The limit pin is used to restrict the reverse rotation of the second cable compensation wheel 2. During cable compensation, when the second cable compensation wheel 2 rotates in a forward direction, the limit pin slides in the arc-shaped limit hole B 19.

[0038] The elastic force adjustment post can be designed as a hexagonal prism structure. In this embodiment, an upper end surface of the elastic force adjustment post 17 is provided with a hexagonal groove 21, and the hexagonal groove 21 is used to match with a hexagonal wrench.

[0039] Working principle: after the invention is applied to a sliding roller shutter door, it can compensate for a cable of the sliding roller shutter door, thereby solving the problem that the sliding roller shutter door becomes slack due to the inconsistency between the pulling speed of the sliding roller shutter door and the unwinding speed of the cable reel of the sliding roller shutter door.

[0040] When the invention is in use, the cable of the sliding roller shutter door 22 passes through the horizontal hole 16 on the cable guide post 15, the cable through hole on the fourth cable compensation wheel 4, the cable through hole on the third cable compensation wheel 3, the cable through hole on the second cable compensation wheel 2, and the cable through hole on the first cable compensation wheel 1 in sequence, forming a tortuous broken line, and then is fixedly connected to a handle on the roller shutter door. When the handle on the roller shutter door is pulled, if the moving speed of the handle is relatively high, the included angle of the broken line of the cable becomes larger, and the broken line state is converted to a straight line state, thereby achieving the purpose of cable compensation.

[0041] In addition, without mutual contradiction, those skilled in the art can combine and integrate different embodiments or examples described in this specification and the features of different embodiments or examples. Although the embodiments of the invention have been shown and described above, it can be understood that the above embodiments are exemplary and cannot be understood as a limitation to the invention. Those of ordinary skill in the art can make changes, modifications, substitutions, and variations to the above embodiments within the scope of the invention.

CLAIMS

1. A cable compensator for a sliding roller shutter door based on a cylindrical cable reel, including a first cable compensation wheel, a second cable compensation wheel, a third cable compensation wheel, and a cylindrical cable reel; each of the first cable compensation wheel, the second cable compensation wheel, and the third cable compensation wheel is provided with a cable through hole; the cylindrical cable reel is used for winding a cable of the sliding roller shutter door; the cable on the cylindrical cable reel passes through the cable through hole on the first cable compensation wheel, the cable through hole on the second cable compensation wheel, and the cable through hole on the third cable compensation wheel in sequence, forming a tortuous broken line; the first cable compensation wheel and the third cable compensation wheel are respectively sleeved with a torsion spring A and a torsion spring B; one end of the torsion spring A is fixed on the first cable compensation wheel, and an other end of the torsion spring A is clamped into a clamping hole on one side of the second cable compensation wheel; one end of the torsion spring B is fixed on the third cable compensation wheel, and an other end of the torsion spring B is clamped into a clamping hole on an other side of the second cable compensation wheel.

2. The cable compensator for a sliding roller shutter door based on a cylindrical cable reel of claim 1, wherein it further includes a base, the first cable compensation wheel, the second cable compensation wheel, and the third cable compensation wheel are arranged in a row and rotatably connected to the base.

3. The cable compensator for a sliding roller shutter door based on a cylindrical cable reel of claim 2, wherein the first cable compensation wheel, the second cable compensation wheel, and the third cable compensation wheel are respectively provided with a first gear, a second gear, and a third gear; the first gear meshes with the second gear, and the second gear meshes with the third gear.

4. The cable compensator for a sliding roller shutter door based on a cylindrical cable reel of claim 3, wherein the second cable compensation wheel is provided with a torsion spring force adjuster, which is used to adjust the elastic force of both torsion spring A and torsion spring B at the same time.

5. The cable compensator for a sliding roller shutter door based on a cylindrical cable reel of claim 4, wherein the torsion spring force adjuster includes an elastic force adjustment post and a limit pin; the second cable compensation wheel is a tubular hollow structure; the elastic force adjustment post is arranged at a center of the second cable compensation wheel, and the elastic force adjustment post is connected to an inner wall of the second cable compensation

wheel through a plurality of connecting plates; an arc-shaped limit hole A is formed between adjacent connecting plates; the base is provided with limit holes B corresponding to the arc-shaped limit holes A; when the elastic force adjustment post is rotated, it drives the second cable compensation wheel to rotate by a preset angle; the second cable compensation wheel then drives the first cable compensation wheel and the third cable compensation wheel to rotate by a preset angle through the first gear, the second gear, and the third gear to adjust the elastic force of torsion spring A and torsion spring B; after that, the limit pin is inserted into the corresponding arc-shaped limit hole B and limit hole A; the limit pin is used to restrict the reverse rotation of the second cable compensation wheel; during cable compensation, when the second cable compensation wheel rotates in a forward direction, the limit pin slides in the arc-shaped limit hole B.

6. The cable compensator for a sliding roller shutter door based on a cylindrical cable reel of claim 5, wherein it further includes a fourth cable compensation wheel, the fourth cable compensation wheel is provided with a cable through hole; the fourth cable compensation wheel is mounted on the base, and arranged in a row with the first cable compensation wheel, the second cable compensation wheel, and the third cable compensation wheel; the fourth cable compensation wheel is provided with a fourth gear, and the fourth gear meshes with the third gear; the cable of the sliding roller shutter door passes through the cable through hole on the fourth cable compensation wheel.

7. The cable compensator for a sliding roller shutter door based on a cylindrical cable reel of claim 6, wherein the base is provided with a cable guide post, the cable guide post is provided with a horizontal hole; the cable of the sliding roller shutter door on the cylindrical cable reel passes through the horizontal hole on the cable guide post.

8. The cable compensator for a sliding roller shutter door based on a cylindrical cable reel of claim 7, wherein the cable guide post is located on one side of the fourth cable compensation wheel and arranged in a row with the first cable compensation wheel, the second cable compensation wheel, the third cable compensation wheel, and the fourth cable compensation wheel.

9. The cable compensator for a sliding roller shutter door based on a cylindrical cable reel of claim 5, wherein the elastic force adjustment post is a hexagonal prism structure, or an upper end surface of the elastic force adjustment post is provided with a hexagonal groove, and the hexagonal groove is used to match with a hexagonal wrench.

10. The cable compensator for a sliding roller shutter door based on a cylindrical cable reel of claim 1, wherein an outer contour of the cylindrical cable reel is a cylindrical structure; a

circumferential surface of the cylindrical structure is provided with a spiral cable groove; the spiral cable groove is used to accommodate the cable so that the cable is wound in an orderly manner on the cylindrical cable reel, thereby ensuring the stability of the cable tension; an end surface of the cylindrical structure is provided with a central hole, and an inner surface of the central hole is provided with a friction damping gear ring; the friction damping gear ring is used to fit with a friction damping block to increase the frictional resistance of the cylindrical cable reel and prevent the cable from rotating relative to the roller shutter, which would cause cable tangling.