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(54) **PULLEY ASSEMBLY WITH DAMPER**

(57) A pulley assembly with damper including a damper assembling clip (10), a movable clip sleeve (11) and an outer support clip (15) arranged in sequence from inner to exterior. A damper assembly including a fixing base (1), a damper (2) and an extension spring (3) is mounted in the damper assembling clip (10), a damper pulling sheet (12) is mounted in a radial through groove

(10-4) of the fixing base (1), and the damper pulling sheet (12) extends out of lower end of the damper assembling clip (10) and is provided with a 7-shaped fixing hook (12-2). The pulley assembly can achieve synchronous damping, ensure smooth move of the door leaf, and avoid swaying and jumping.

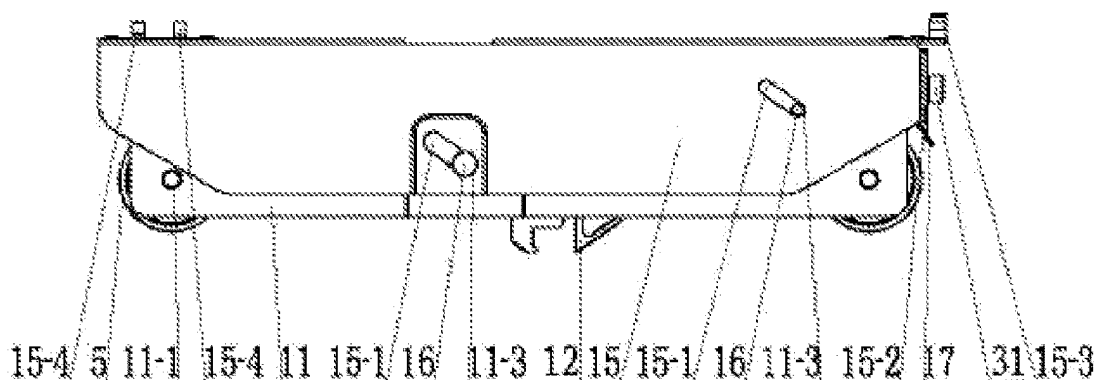


Fig. 1

## Description

### FIELD OF THE INVENTION

[0001] The present invention relates to the field of ornamental accessory, especially relates to an ornamental accessory of a cupboard door, and more especially relates to a pulley assembly with damper.

### BACKGROUND OF THE INVENTION

[0002] Cupboards are commonly used in businesses and households, and people always build one or several cupboards when ornamenting rooms, because they can store large amounts of things such as clothes and quilts. The cupboard has two or three cupboard doors at its front end, which are usually pulled and pushed by hand. Tracks for sliding are mounted on the upper and lower doorframes of the cupboard door, pulleys are mounted on the upper and lower ends of the door leaf thereof, and pulleys slide on the tracks for sliding to make pushing and pulling easily and quickly. However, when only pulleys are mounted to the cupboard door, sliding speeds differ that the door leaf run fast when being pulled or pushed hard, and conversely when being pulled or pushed lightly. Whereas, the door leaf may collide with vertical door frame when it is pulled or pushed too hard, giving a bad feeling to users, and even damaging the door. Currently, some factories produce a pulley assembly with damper for cupboard, and the pulley and the track for sliding are mounted on the upper and the lower ends of cupboard door leaves. In this way the problem brought by sliding too fast is solved and the cupboard door can slide slowly to the vertical door frame without collision. However, there are still following problems in using this pulley assembly with damper for cupboard: (1) the door leaf jumps when the dampers of the upper end and the lower end of the door leaf do not work asynchronously, for example, the upper end does not move or move slowly while the lower end continues to move quickly when the door leaf is being pushed to close and the dampers are functioning; (2) the cupboard is inconvenient for installation and adjustment because it is usually tall; (3) there is high cost for producing components; (4) the damper of the pulley assembly does not work well; and (5) dragging effect and damping effect of the existing pulley assembly are bad as to the heavy door leaf.

### SUMMARY OF THE INVENTION

[0003] The problem the present invention aims to solve is to provide a pulley assembly with damper, which is of reasonable structure, compact assembly and precise manufacture, and easy to be installed and adjusted, and which also can achieve synchronous and excellent damping effect, and ensure smooth move of the door leaf and avoid swaying and jumping.

[0004] In order to solve the abovementioned technical

problem, the present invention provides a pulley assembly with damper, wherein it includes a damper assembling clip, a movable clip sleeve and an outer support clip arranged in sequence from interior to exterior;

a damper assembly including a fixing base, a damper and an extension spring is mounted in the damper assembling clip, a damper pulling sheet is mounted in a radial through groove of the fixing base, and the damper pulling sheet extends out of lower end of the damper assembling clip and is provided with a 7-shaped fixing hook;

the movable clip sleeve is provided with symmetrical pulley assembling holes, and pulleys are mounted in the pulley assembling holes;

a movable rivet passes through kidney-shaped holes of the outer support clip, pin holes of the movable clip sleeve, and pin holes of the damper assembling clip, to assemble the outer support clip, the movable clip sleeve, and the damper assembling clip together as a whole.

[0005] As an improvement of the abovementioned solution, the outer support clip is provided with at least two kidney-shaped holes, an circular arc-shaped clip hook is mounted on one end of top surface of the outer support clip, a front and a back semicircular arc-shaped hooks are mounted on the other end of the top surface of the outer support clip, and a screw limit clip is mounted at a side of the outer support clip.

[0006] As an improvement of the abovementioned solution, the pulley assembly also includes a track and a stop dog mounted in the track;

at least two spaced post stands each of which has a post stand screw hole in its middle part and a through hole at its side are mounted in the stop dog; two triangular groove stands facing opposite directions are respectively mounted in both ends of groove of the stop dog, and the stop dog is provided with a Socket head screw used in conjunction with a rectangular iron sheet which has an iron sheet screw hole in its middle part.

[0007] As an improvement of the abovementioned solution, the damper pulling sheet is an anomalous rectangular plate body, the 7-shaped fixing hook is mounted at a side of upper part of the body, a triangular backing arm is connected to the upper part of the body opposite to the 7-shaped fixing hook; a stopping hook is connected to lower part of the triangular backing arm, a lapping hook is connected to a side of the body abutting upper part of the stopping hook; at least an empty groove is mounted under the stopping hook; a rectangular groove is mounted between the triangular backing arm and the 7-shaped fixing hook.

**[0008]** As an improvement of the abovementioned solution, the damper pulling sheet is provided with at least two cylindrical pins at middle part of its body, which are mounted parallel to each other and respectively protrude from both sides, a stretching rod clamping opening is mounted at a side of lower part of the body, a spring clamping hole with rabbet at the bottom is mounted at the lowest end of the body; the body of the damper pulling sheet is assembled through in a radial through groove of the fixing base, and the cylindrical pins are inlayed in a bending clip groove an end of which is bent and which is mounted at middle part of surface of the fixing base.

**[0009]** As an improvement of the abovementioned solution, the damper assembling clip is provided with a spring assembling groove in radial direction at its upper part, a rectangular hole for damper at its middle part, and a moving groove for protruding head of pulling sheet at a side, a radial through groove at its bottom and a pin hole at its middle part below the rectangular hole for damper; support spring assembling holes are respectively mounted at surfaces of left and right ends of upper part of the damper assembling clip, and a connection hole for movable clip sleeve is mounted under each of the support spring assembling hole.

**[0010]** As an improvement of the abovementioned solution, wherein the damper pulling sheet is inlayed vertically into the radial through groove of the damper assembling clip; one end of the extension spring is connected in a spring clamping hole mounted at right end of the spring assembling groove, and the other end thereof is connected in a spring clamping hole mounted at upper end of the damper pulling sheet; the damper is inlayed in the rectangular hole for damper, a stretching rod head of the damper is connected in a stretching rod clamping opening of the damper pulling sheet, and symmetrical cylindrical pins at middle part of the damper pulling sheet are inlayed in the moving groove for protruding head of pulling sheet; the 7-shaped fixing hook at lower part of the damper pulling sheet extends out of lower end of the damper assembling clip; support springs are riveted respectively by rivets in the support spring assembling holes mounted at both left and right ends of upper part of the damper assembling clip.

**[0011]** As an improvement of the abovementioned solution, wherein the movable clip sleeve is a rectangular clip sleeve connected by left, right and top parts; symmetrical pulley assembling holes are mounted at two ends of lower part of the movable clip sleeve, connection holes for overlapping and connecting with the damper assembling clip are mounted symmetrically at both ends of upper part of the movable clip sleeve, and pin holes are mounted at middle part of the movable clip sleeve; the damper assembling clip is overlapped and riveted with the movable clip sleeve by a rivet passing through the connection holes of the movable clip sleeve and connection holes of the damper assembling clip.

**[0012]** As an improvement of the abovementioned solution, wherein the outer support clip is a clip sleeve with

opening, on an end face of which an hole for adjusting bolt is mounted; an adjusting bolt provided with an inner hexagonal screw hole is mounted in the hole for adjusting bolt, and a nut sheet is mounted to the adjusting bolt; and height of cupboard door leaf can be adjusted through the adjusting bolt in conjunction with support springs mounted on both ends of the damper assembling clip.

**[0013]** There are following advantages by carrying out embodiments of the present invention.

**[0014]** The present invention discloses a pulley assembly with pumper, which is of reasonable structure, compact assembly, precise manufacture, and easy to be installed and adjusted, and which can also achieve synchronous and excellent damping effect, ensure smooth move of the door leaf and avoid swaying and jumping. The advantages are listed in detail as follows.

1. It is of novel design, reasonable structure, compact assembly and precise manufacture: the outer supporting clip being provided with at least two kidney-shaped holes, preferably, two inclined kidney-shaped holes, to ensure parallelism of the whole pulley assembly; an circular arc-shaped clip hook being mounted on one end of top side of the outer support clip, and a front and a back semicircular arc-shaped hooks being mounted on the other end of the top side of the outer support clip, to fix the pulley assembly steadily, meanwhile to make assembling easy and accurate and avoid wrong assembly; a screw limit clip being mounted at a side of the outer support clip, to fix position and eliminate gap; support springs being mounted at both sides of the pulley assembly, to absorb shock.

2. The damper pulling sheet has an automatic reset function, to prevent the pulley getting out of the track for sliding, to prevent the damper pulling sheet being unhooked from the stop dog, and to ensure normal open and closure of the cupboard door leaf. When the damper pulling sheet is unhooked from the stop dog, the triangular backing arm will yield back and let the triangular groove stand of the stop dog slide by the triangular backing arm, and the triangular backing arm lifts again automatically by elastic force of itself and then get into groove stand of the triangular groove stand, and in this way the triangular backing arm is hooked by the triangular groove stand. Therefore, when the cupboard door leaf moves, the damper pulling sheet which has a ingenious and precise structure with an automatic reset function will be pulled back by the triangular groove stand and will not get out until being pulled to the bending portion of the bending clip groove, and at the time the damper pulling sheet is stopped and "strung".

3. The pulley assembly of the present invention, in conjunction with the stop dog with function of pre-

venting unhooking, can make the unhooked pulling sheet hook again and reach the normal position to hook at the second run, make the pulley assembly implement normal damping, and ensure safe and smooth move of the cupboard door leaf.

4. Installation and adjustment is easy for the present invention because favorable damping effect can be obtained by adjusting height of the cupboard door leaf with adjusting bolt and adjusting embedding position of the stop dog as it is embedded in upper and/or lower tracks.

5. Pulley assembly with damper of the present invention can be installed in different modes and used widely: it can be used as a lower wheel in conjunction with an ordinary upper wheel or an upper damping wheel, or used as a upper wheel in conjunction with an ordinary wheel, or used as both upper wheel and lower wheel, to enhance smoothness of moving of the cupboard door leaf greatly, to realize synchronous damping and to make installation and adjustment easier.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

##### **[0015]**

Figure 1 is a front view of the pulley assembly with damper of the present invention;

Figure 2 is a left view of the pulley assembly with damper of Figure 1;

Figure 3 is a right view of the pulley assembly with damper of Figure 1;

Figure 4 is a bottom view of the pulley assembly with damper of Figure 1;

Figure 5 is a top view of the pulley assembly with damper of Figure 1;

Figure 6 is a perspective view of the pulley assembly with damper of Figure 1;

Figure 7 is a front view of the damper assembly of the pulley assembly with damper of the present invention;

Figure 8 is a bottom view of the damper assembly with damper of Figure 7;

Figure 9 is a top view of the damper assembly with damper of Figure 7;

Figure 10 is a perspective view of the damper assembly with damper of Figure 7;

Figure 11 is a front view of the damper pulling sheet in the pulley assembly with damper of the present invention;

Figure 12 is a left view of the damper pulling sheet with damper of Figure 11;

Figure 13 is a bottom view of the damper pulling sheet with damper of Figure 11;

Figure 14 is a perspective view of the damper pulling sheet with damper of Figure 11;

Figure 15 is a perspective view of the upper track with damper in the present invention;

Figure 16 is a front view of the upper track with damper in the present invention;

Figure 17 is a perspective view of the screw limit clip with damper in the present invention;

Figure 18 is an exploded view of the stop dog with damper in the present invention;

Figure 19 is a perspective view of the stop dog with damper in the present invention;

Figure 20 is a view showing use condition of the pulley assembly with damper of the present invention;

Figure 21 is a view showing another use condition of the pulley assembly with damper of the present invention;

Figure 22 is a view showing unhooked condition of the pulley assembly with damper of the present invention;

Figure 23 is a view showing hooked condition after unhooked of the pulley assembly with damper of the present invention;

Figure 24 is a view showing a first installation mode of the pulley assembly with damper of the present invention;

Figure 25 is a view showing a second installation mode of the pulley assembly with damper of the present invention;

Figure 26 is a view showing a third installation mode of the pulley assembly with damper of the present invention;

Figure 27 is a view showing a fourth installation mode of the pulley assembly with damper of the present invention;

Figure 28 is a view showing a fifth installation mode of the pulley assembly with damper of the present invention;

Figure 29 is a view showing a sixth installation mode of the pulley assembly with damper of the present invention.

**[0016]** Reference signs in the drawings are as follows: 1 fixing base, 2 damper, 2-1 stretching rod head of damper, 3 extension spring, 5 pulley, 6 cupboard door leaf, 10 damper assembling clip, 10-1 spring assembling groove, 10-2 rectangular hole for damper, 10-3 moving groove for protruding head of pulling sheet, 10-4 radial through groove, 10-5 pin hole, 10-6 support spring assembling clip, 10-7 connection hole for movable clip sleeve, 10-8 spring clamping hole, 11 movable clip sleeve, 11-1 pulley assembling hole, 11-3 pin hole, 12 damper pulling sheet, 12-1 rectangular plate body, 12-2 7-shaped fixing hook, 12-3 triangular backing arm, 12-4 stopping hook, 12-5 lapping hook, 12-6 empty groove, 12-7 rectangular groove, 12-8 cylindrical pin, 12-9 stretching rod clamping opening, 12-10 spring clamping hole, 15 outer support clip, 15-1 kidney-shaped hole, 15-2 hole for adjusting bolt, 15-3 clip hook, 15-4 left and right circular arc-shaped hooks, 16 movable rivet, 17 screw limit clip, 17-1 screw groove, 17-2 elastic sheet, 18 pulley assembly, 19 upper track, 19-1 guide groove I, 19-2 guide groove II, 19-3 "┐" shaped groove, 19-4 clamping strip, 19-5 strengthening rib, 20 stop dog, 20-1 post stand, 20-2 post stand screw hole, 20-3 through hole, 20-4 triangular groove stand, 21 Socket head screw hole, 22 rectangular iron sheet, 22-1 iron sheet screw hole, 31 adjusting bolt, 32 support spring, and 33 ordinary pulley assembly.

#### **DETAILED DESCRIPTION OF THE INVENTION**

**[0017]** In order to clarify objection, technical solution and advantages of the present invention, preferred embodiments according to the present invention will be described in detail with reference to the figures as follows.

**[0018]** With reference to Figures 1 to 29, an embodiment of the present invention provides a pulley assembly with damper, which includes a damper assembling clip 10, a movable clip sleeve 11 and an outer support clip 15 arranged in sequence from interior to exterior; a damper assembly including a fixing base 1, a damper 2 and an extension spring 3 is mounted in the damper assembling clip 10, and a damper pulling sheet 12 which extends out of lower end of the damper assembling clip 10 and which is provided with a 7-shaped fixing hook 12-2 is mounted in a radial through groove 10-4 of the fixing base 1; the movable clip sleeve 11 is provided with symmetrical pulley assembling holes 11-1, and pulleys 5 are mounted in the pulley assembling holes 11-1; a movable rivet 16 passes through kidney-shaped holes

15-1 of the outer support clip 15, pin holes 11-3 of the movable clip sleeve 11, and pin holes 10-5 of the damper assembling clip 10, to assemble the outer support clip 15, the movable clip sleeve 11 and the damper assembling clip 10 together as a whole.

**[0019]** As an improvement of the abovementioned solution, the damper assembling clip 10 is a rectangular clip sleeve and engineering plastic item, which is provided with a spring assembling groove 10-1 in radial direction at its upper part, a rectangular hole for damper 10-2 at its middle part, and a moving groove for protruding head of pulling sheet 10-3 at a side, a radial through groove 10-4 at its bottom and a pin hole 10-5 at its middle part below the rectangular hole for damper 10-2; support spring assembling holes 10-6 are respectively mounted at surfaces of both left and right ends of upper part of the damper assembling clip 10, and a connection hole for movable clip sleeve 10-7 is mounted under each of the support spring assembling hole 10-6.

**[0020]** The damper pulling sheet 12 is inlaid vertically into the radial through groove 10-4 of the damper assembling clip 10; one end of the extension spring 3 is connected in a spring clamping hole 10-8 mounted at right end of the spring assembling groove 10-1, and the other end thereof is connected in a spring clamping hole 12-10 mounted at upper end of the damper pulling sheet 12; the damper 2 is inlaid in the rectangular hole 10-2 for assembly of damper, a stretching rod head 2-1 of the damper 2 is connected in a stretching rod clamping opening 12-9 of the damper pulling sheet 12, and symmetrical cylindrical pins 12-8 at middle part of the damper pulling sheet 12 are inlaid in the moving groove for protruding head of pulling sheet 10-3; the 7-shaped fixing hook 12-2 at lower part of the damper pulling sheet 12 extends out of lower end of the damper assembling clip 10; support springs 32 are riveted respectively by rivets in the support spring assembling holes 10-6 mounted at both left and right ends of upper part of the damper assembling clip 10. Two curved steel wires of the support springs 32 are mounted upward and can burden force transmitted from above.

**[0021]** As an improvement of the abovementioned solution, the movable clip sleeve 11 is a rectangular clip sleeve connected by left, right and top parts, symmetrical pulley assembling holes 11-1 are mounted at two ends of lower part of the movable clip sleeve 11, connection holes for overlapping and connecting with the damper assembling clip 10 are mounted symmetrically at both ends of upper part of the movable clip sleeve 11, and pin holes 11-3 are mounted at middle part of the movable clip sleeve 11.

**[0022]** The damper assembling clip 10 is overlapped and riveted with the movable clip sleeve 11 by a rivet passing through the connection holes of the movable clip sleeve 11 and connection holes for movable clip sleeve 10-7 of the damper assembling clip 10.

**[0023]** As an improvement of the abovementioned solution, the outer support clip 15 is provided with at least

two kidney-shaped holes 15-1, an circular arc-shaped clip hook 15-3 is mounted on one end of top surface of the outer support clip 15, a front and a back semicircular arc-shaped hooks 15-4 are mounted on the other end of the top surface of the outer support clip 15, and a screw limit clip 17 is mounted at a side of the outer support clip 15.

**[0024]** Preferably, the outer support clip 15 is provided with two kidney-shaped holes 15-1, to ensure parallelism of the whole pulley assembly, to ensure the pulley assembly not tilting when the movable clip sleeve 11 is adjusted upward, and to ensure that the pulley assembly is steady when it is adjusted upward or downward.

**[0025]** Further, a screw limit clip 17 which includes a screw groove 17-1 and elastic sheets 17-2 is mounted under the adjusting bolt 31 assembled on the outer support clip 15, and the two elastic sheets 17-2 of the screw

limit clip 17 push against both sides of the "┐"-shaped groove of vertical frame of the cupboard door leaf, to ensure the pulley assembly function normally, and to further prevent the cupboard door leaf colliding with the door frame.

**[0026]** As an improvement of the abovementioned solution, the outer support clip 15 is a clip sleeve with opening, on end face of which an hole for adjusting bolt 15-2 is mounted, an adjusting bolt 31 provided with an inner hexagonal screw hole is mounted in the hole for adjusting bolt 15-2, a nut sheet is mounted to the adjusting bolt 31; height of the cupboard door leaf can be adjusted through the adjusting bolt 31 in conjunction with the support springs 32 on both ends of the damper assembling clip 10.

**[0027]** The adjusting bolt 31 can adjust height and tightness of the cupboard door leaf. If too loose, then adjust the adjusting bolt 31 at a side with Socket head screw spanner, to make the movable clip sleeve 11 up or down in the inclined kidney-shaped hole 15-1, in order to make the pulley 5 of the pulley assembly pressed and positioned in "┐"-shaped grooves of upper and lower tracks and move smoothly with proper tightness, therefore the cupboard door leaf moves at an optimal height.

**[0028]** As an improvement of the abovementioned solution, the pulley assembly also includes a track and a stop dog 20 mounted in the track;

at least two spaced post stands 20-1, each of which has a post stand screw hole 20-2 in its middle part and a through hole 20-3 at its side, are mounted in the stop dog 20;

two triangular groove stands 20-4 facing opposite directions are respectively mounted in both ends of groove of the stop dog 20; and the stop dog 20 is provided with a Socket head screw 21 used in conjunction with a rectangular iron sheet 22 which has an iron sheet screw hole 22-1 in its middle part.

**[0029]** Preferably, the through hole 20-3 is a rectangular through hole.

**[0030]** Taking mounting the pulley assembly to top

transverse of the cupboard door leaf as an example, a matching upper track 19 must be mounted thereon first. The upper track 19 is comprised of a guide groove I 19-1 and a guide groove II 19-2 with identical structures, each

of which is provided with a "┐"-shaped groove 19-3 whose opening faces adown in the middle of its bottom, horizontal clamping strips 19-4 are respectively mounted

at lower ends of both sides of each "┐"-shaped groove 19-3 for assembling the stop dog 20 and fitting the pulley

5, the stop dog 20 is embedded in the "┐"-shaped groove and pressed against inner bottom of the clamping strips 19-4, and both end faces of the pulley 5 are located on the clamping strips 19-4 and slide on the clamping strips 19-4. Strengthening ribs 19-5 are connected between the two "┐"-shaped grooves and at both sides of each "┐"-shaped groove.

**[0031]** Moreover, taking embedding the stop dog 20 in

the "┐"-shaped groove of the upper track 19 as an example, firstly, implant the rectangular iron sheet 22 into the rectangular through hole 20-3 at the side of the post stand 20-1, push the stop dog 20 with its bottom facing upward and the post stand 20-1 facing adown into the

"┐"-shaped groove 19-3 of the upper track 19, and then screw the Socket head screw 21 into the post stand screw hole 20-4 of the post stand 20-1 and also into the iron sheet screw hole 22-1 until reaching the bottom of the

"┐"-shaped groove 19-3 of the upper track 19, move the stop dog 20 in reverse to make top surface thereof be pressed against the clamping strips 19-4 of the "┐"-shaped grooves, and at the time the stop dog 20 can not

move any more and is assembled in the "┐"-shaped groove steadily.

**[0032]** In like manner, taking mounting the pulley assembly in the bottom transverse of the cupboard door leaf as an example, a matching lower track must be mounted, and then push the stop dog 20 with its bottom facing adown and its top surface facing upward into the

"┐"-shaped groove of the lower track, and likewise, screw the Socket head screw 21 into the post stand screw hole 20-4 of the post stand 20-1 until the stop dog 20 can not move in the "┐"-shaped groove.

**[0033]** As an improvement of the abovementioned solution, the damper pulling sheet 12 is an anomalous rectangular plate body 12-1, the 7-shaped fixing hook 12-2 is mounted at a side of upper part of the body 12-1, a triangular backing arm 12-3 is connected to upper part of the body 12-1 opposite to the 7-shaped fixing hook 12-2; a stopping hook 12-4 is connected to lower part of the backing arm 12-3, a lapping hook 12-5 is connected to a side of the body 12-1 closing to the upper part of the stopping hook 12-4; at least an empty groove 12-6 is mounted under the stopping hook 12-4; and a rectangular groove 12-7 is mounted between the triangular backing

arm 12-3 and the 7-shaped fixing hook 12-2.

**[0034]** Preferably, the empty groove 12-6 is a rectangular empty groove.

**[0035]** The damper pulling sheet 12 is provided with at least two cylindrical pins 12-8 at middle part of its body 12-1, which are mounted parallel to each other and respectively protrude from both sides; a stretching rod clamping opening 12-9 is mounted at a side of lower part of the body 12-1, a spring clamping hole with rabbet at bottom 12-10 is mounted at the lowest end of the body 12-1; the body 12-1 of the damper pulling sheet 12 is mounted through in the radial through groove 10-4 of the fixing base 1, and the cylindrical pins 12-8 are inlaid in a bending clip groove an end of which is bent and which is mounted at middle part of surface of the fixing base 1.

**[0036]** Preferably, two cylindrical pins 12-8 which are mounted parallel to each other and respectively protrude from both sides are mounted at middle part of the body 12-1 of the damper pulling sheet 12.

**[0037]** Applied situation of the damper pulling sheet 12 will be introduced next, and that is, mounting the fixing base 1 assembled with the damper 2, the extension spring 3 and the damper pulling sheet 12 which can reset automatically, into the pulley assembling clip 10, then inserting the pulley assembling clip 10 into the movable clip sleeve 11, and then making the pulley assembling clip 10 and the movable clip sleeve 11 together being enwrapped into the outer support clip 15 to constitute a pulley assembly. The pulley assemblies are then assembled into ends of the cupboard door leaf 6, and meanwhile the stop dogs 20 are assembled into ends of the upper and the lower tracks, to finish assembling the cupboard door leaf.

**[0038]** Next, we will introduce how the damper pulling sheet 12 which can reset automatically functions on the cupboard door leaf 6. After the cupboard door leaf is assembled, the damper pulling sheet 12 which can reset automatically should be pulled back by hand from its original position at middle and lower part of the fixing base 1, to make the two cylindrical pins move in the bending clip groove until one of the cylindrical pins reaches the bending portion at a side of the bending clip groove, where the damper pulling sheet 12 stops and at the same time the stretching rod 2-1 of the damper 2 and the extension spring 3 respectively reach their maximal extent, and we call this condition "strung". When the cupboard door leaf 6 is being closed from right to left after it was open, as shown in Figure 20, a fore-head of the triangular groove stand 20-4 of the stop dog 20 is hooked by the 7 shaped fixing hook 12-2 mounted at upper part of the pulling sheet 12 when the cupboard door leaf reaches the stop dogs 20 mounted at ends of the upper and the lower tracks, and referring to Figure 21, the whole triangular groove stand 20-4 gets into the rectangular groove 12-7 of the pulling sheet 12 in the period of the cupboard door leaf moving slowly. In that way, the pulling sheet 12 gets out of the bending portion of the bending clip groove of the fixing base and we call this condition "unhooked",

and at which time the extension spring 3 retracts back and pulls hard the cupboard door leaf 6 in right direction to resist movement of the cupboard door leaf 6 itself towards left, and then the cupboard door leaf 6 can approach the door frame slowly and smoothly without jumping and collision because of balance of the forces from two opposite directions.

**[0039]** Automatic reset function of the damper pulling sheet 12 which can reset automatically will be introduced next. The pulling sheet 12 will not implement damping, if the operator forgets to "string" the pulling sheet 12 or the pulling sheet 12 is unhooked under some condition. However, the triangular groove stand 20-4 at fore-end of the stop dog 20 will collide with the triangular backing arm 12-3 of the pulling sheet 12 as shown in Figure 22 when the pulling sheet 12 reaches position of the stop dog 20 during the cupboard door leaf 6 returning from right to left, the triangular backing arm 12-3 will back and let the triangular groove stand 20-4 slide by the triangular backing arm 12-3, and the triangular backing arm 12-3 will go up again for its elastic force to make itself get into triangular groove stand of the triangular groove stand 20-4, and in this way the triangular backing arm 12-3 is hooked by the triangular groove stand 20-4 as shown in Figure 23. When the cupboard door leaf 6 moves towards right, the pulling sheet 12 will be pulled backwards by the triangular groove stand 20-4 and will not get out until reaching the bending portion of the bending clip groove, and at which moment, the pulling sheet 12 is stopped and "strung". The movement referred by Figure 20 will repeat when the cupboard door leaf 6 is being closed after it was open, and the pulling sheet 12 will again be hooked by the triangular groove stand 20-4 of the stop dog 20 to implement damping. The pulling sheet 12 will function normally with the aid of the stop dog 20.

**[0040]** The abovementioned is the automatic reset function of the damper pulling sheet 12 which can reset automatically, and the structure for this automatic reset function is designed very skillfully and accurately to ensure the cupboard door leaf 6 closing and opening normally.

**[0041]** Next, working condition of the present invention will be illustrated with reference to Figure 20 and Figure 21. As we see, when we open the cupboard door leaf 6, the damper pulling sheet 12 of the damper assembly on top transverse of the cupboard door leaf is totally hooked by the triangular groove stand 20-4 of the stop dog 20, and the pulling sheet 12 is pulled backwards and strung totally; the damper pulling sheet 12 of the damper assembly on bottom transverse of the cupboard door leaf is also hooked by the triangular groove stand 20-4 of the stop dog 20 totally, and the pulling sheet 12 is pulled backwards and strung totally; the cupboard door leaf 6 then move right normally after getting rid of the stop dog 20, and the cupboard door leaf 6 is thus open and is available for taking out things and putting things in. The cupboard door leaf 6 is pushed from right to left when it is being closed, when the upper and the lower damper

assemblies of the cupboard door leaf 6 slide to side end of the stop dog 20 (see Figure 25), clip opening of the damper pulling sheet 12 mounted on the top transverse 2 will get into the triangular groove stand 20-4 of the stop dog 20 totally, and the damper pulling sheet 12 is then unhooked and implements damping to pull the cupboard door leaf 6 right reversely in order to resist the movement towards left of the cupboard door leaf 6 itself; in like manner, clip opening of the damper pulling sheet 12 mounted on the bottom transverse will get into the triangular groove stand 20-4 of the stop dog 20 totally, and the damper pulling sheet 12 is then unhooked and implements damping to pull the cupboard door leaf 6 right reversely in order to resist the movement towards left of the cupboard door leaf 6 itself; in this way the cupboard door leaf 6 will approach the door frame slowly because of damping function of the damper pulling sheet 12, without jumping and collision, and meanwhile two elastic sheets 17-2 of the screw limit clip 17 mounted on the outer support clip 15 press on both sides of the "┐"-shaped groove of vertical frame, further to prevent the cupboard door leaf 6 from colliding with the door frame and ensure reaching position smoothly.

**[0042]** Finally, we will illustrate installation modes of the pulley assembly with damper of the present invention, and the pulley assembly with damper of the present invention can be used as lower wheel in conjunction with ordinary upper wheel and damper upper wheel, or used as upper wheel in conjunction with ordinary lower wheel, or used as both upper wheel and lower wheel, to enhance moving smoothness of the cupboard door leaf, obtain synchronous damping, and make assembling and adjustment easier. The favorable assembling modes are as follows:

1. as shown in Figure 24, pulley assemblies 18 of the present invention are mounted at both right and left sides of top transverse, and both right and left sides of bottom transverse of the cupboard door leaf;
2. as shown in Figure 25, pulley assemblies 18 of the present invention are mounted at both right and left sides of top transverse of the cupboard door leaf, and ordinary pulley assemblies 33 are mounted at both right and left sides of bottom transverse of the cupboard door leaf;
3. as shown in Figure 26, pulley assemblies 18 of the present invention are mounted at both right and left sides of bottom transverse of the cupboard door leaf, and ordinary pulley assemblies 33 are mounted at both right and left sides of top transverse of the cupboard door leaf;
4. as shown in Figure 27, pulley assemblies 18 of the present invention are mounted at same sides of both bottom and top transverses of the cupboard

door leaf, and ordinary pulley assemblies 33 are mounted at the other sides of both bottom and top transverses of the cupboard door leaf;

5. as shown in Figure 28, pulley assembly 18 of the present invention is mounted at one side, and ordinary pulley assembly 33 is mounted at the other side of top transverse of the cupboard door leaf, and also ordinary pulley assemblies 33 are mounted at both sides of bottom transverse of the cupboard door leaf.

6. and as shown in Figure 29, pulley assembly 18 of the present invention is mounted at one side, and ordinary pulley assembly 33 is mounted at the other side of bottom transverse of the cupboard door leaf, and ordinary pulley assemblies 33 are mounted at both sides of top transverse of the cupboard door leaf.

**[0043]** The technical solution described above is only a preferable embodiment of the present invention, and can not be used to limit coverage of the present invention, and all equivalent variations according to claims of the present invention are in the coverage of the present invention.

## Claims

1. A pulley assembly with damper, wherein it includes a damper assembling clip (10), a movable clip sleeve (11) and an outer support clip (15) arranged in sequence from interior to exterior; a damper assembly including a fixing base (1), a damper (2) and an extension spring (3) is mounted in said damper assembling clip (10), a damper pulling sheet (12) is mounted in a radial through groove (10-4) of said fixing base (1), and said damper pulling sheet (12) extends out of lower end of said damper assembling clip (10) and is provided with a 7-shaped fixing hook (12-2); said movable clip sleeve (11) is provided with symmetrical pulley assembling holes (11-1), and pulleys (5) are mounted in said pulley assembling holes (11-1); a movable rivet (16) passes through kidney-shaped holes (15-1) of said outer support clip (15), pin holes (11-3) of said movable clip sleeve (11), and pin holes (10-5) of said damper assembling clip (10), to assemble said outer support clip (15), said movable clip sleeve (11), and said damper assembling clip (10) together as a whole.
2. The pulley assembly according to Claim 1, wherein said outer support clip (15) is provided with at least two kidney-shaped holes (15-1), an circular arc-shaped clip hook (15-3) is mounted on one end of top surface of said outer support clip (15), a front and

a back semicircular arc-shaped hooks (15-4) are mounted on the other end of the top surface of said outer support clip (15), and a screw limit clip (17) is mounted at a side of said outer support clip (15).

3. The pulley assembly according to Claim 1, wherein said pulley assembly also includes a track and a stop dog (20) mounted in said track;  
at least two spaced post stands (20-1) each of which has a post stand screw hole (20-2) in its middle part and a through hole (20-3) at its side are mounted in said stop dog (20);  
two triangular groove stands (20-4) facing opposite directions are respectively mounted in both ends of groove of said stop dog (20), and said stop dog (20) is provided with a socket head screw used in conjunction with a rectangular iron sheet (22) which has an iron sheet screw hole (22-1) in its middle part.
4. The pulley assembly according to Claim 1, wherein said damper pulling sheet (12) is an anomalous rectangular plate body (12-1), said 7-shaped fixing hook (12-2) is mounted at a side of upper part of said body (12-1), a triangular backing arm (12-3) is connected to the upper part of said body (12-1) opposite to said 7-shaped fixing hook (12-2); a stopping hook (12-4) is connected to lower part of said triangular backing arm (12-3), a lapping hook (12-5) is connected to a side of said body (12-1) abutting upper part of said stopping hook (12-4); at least an empty groove (12-6) is mounted under said stopping hook (12-4); a rectangular groove (12-7) is mounted between said triangular backing arm (12-3) and said 7-shaped fixing hook (12-2).
5. The pulley assembly according to Claim 4, wherein said damper pulling sheet (12) is provided with at least two cylindrical pins (12-8) at middle part of its body (12-1), which are mounted parallel to each other and respectively protrude from both sides, a stretching rod clamping opening (12-9) is mounted at a side of lower part of said body (12-1), a spring clamping hole (12-10) with rabbet at the bottom is mounted at the lowest end of said body (12-1); said body (12-1) of said damper pulling sheet (12) is assembled through in a radial through groove (10-4) of said fixing base (1), and said cylindrical pins (12-8) are inlaid in a bending clip groove an end of which is bent and which is mounted at middle part of surface of said fixing base (1).
6. The pulley assembly according to Claim 1, wherein said damper assembling clip (10) is provided with a spring assembling groove (10-1) in radial direction at its upper part, a rectangular hole for damper (10-2) at its middle part, and a moving groove for protruding head of pulling sheet (10-3) at a side, a radial through groove (10-4) at its bottom and a pin hole (10-5) at

its middle part below said rectangular hole for damper (10-2); support spring assembling holes (10-6) are respectively mounted at surfaces of left and right ends of upper part of said damper assembling clip (10), and a connection hole for movable clip sleeve (10-7) is mounted under each of said support spring assembling hole (10-6).

7. The pulley assembly according to Claim 6, wherein said damper pulling sheet (12) is inlaid vertically into said radial through groove (10-4) of said damper assembling clip (10); one end of said extension spring (3) is connected in a spring clamping hole (10-8) mounted at right end of said spring assembling groove (10-1), and the other end thereof is connected in a spring clamping hole (12-10) mounted at upper end of said damper pulling sheet (12); the damper (2) is inlaid in said rectangular hole for damper (10-2), a stretching rod head (2-1) of the damper (2) is connected in a stretching rod clamping opening (12-9) of said damper pulling sheet (12), and symmetrical cylindrical pins (12-8) at middle part of said damper pulling sheet (12) are inlaid in the moving groove for protruding head of pulling sheet (10-3); the 7-shaped fixing hook (12-2) at lower part of said damper pulling sheet (12) extends out of lower end of the damper assembling clip (10); support springs (32) are riveted respectively by rivets in the support spring assembling holes (10-6) mounted at both left and right ends of upper part of the damper assembling clip (10).
8. The pulley assembly according to Claim 1, wherein said movable clip sleeve (11) is a rectangular clip sleeve connected by left, right and top parts; symmetrical pulley assembling holes (11-1) are mounted at two ends of lower part of said movable clip sleeve (11), connection holes for overlapping and connecting with said damper assembling clip (10) are mounted symmetrically at both ends of upper part of said movable clip sleeve (11), and pin holes (11-3) are mounted at middle part of said movable clip sleeve (11);  
said damper assembling clip (10) is overlapped and riveted with said movable clip sleeve (11) by a rivet passing through the connection holes of said movable clip sleeve (11) and connection holes (10-7) of said damper assembling clip (10).
9. The pulley assembly according to Claim 1, wherein said outer support clip (15) is a clip sleeve with opening, on an end face of which an hole for adjusting bolt (15-2) is mounted; an adjusting bolt (31) provided with an inner hexagonal screw hole is mounted in said hole for adjusting bolt (15-2), and a nut sheet is mounted to said adjusting bolt (31); and height of cupboard door leaf can be adjusted through said adjusting bolt (31) in conjunction with support springs

(32) mounted on both ends of said damper assembling clip (10).

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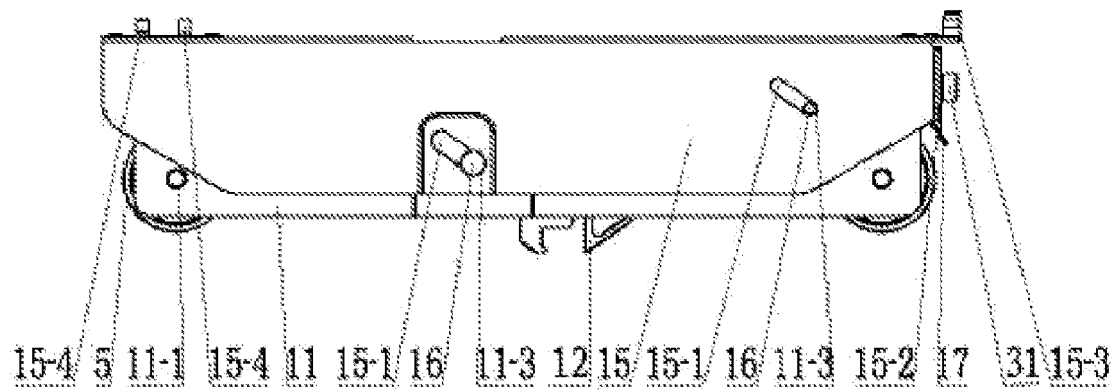


Fig. 1

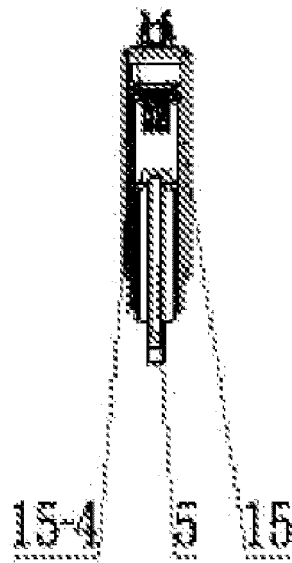


Fig. 2

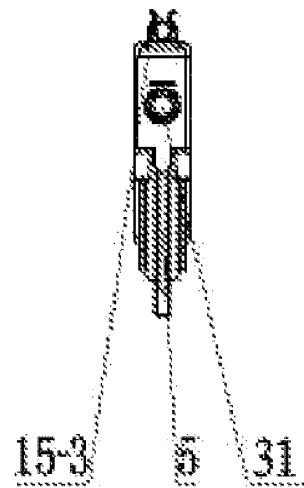


Fig. 3

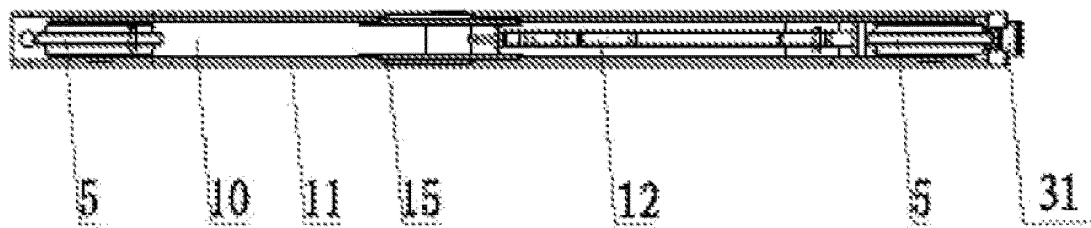


Fig. 4

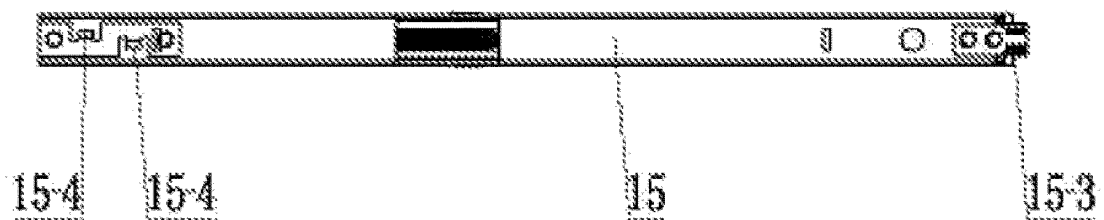


Fig. 5

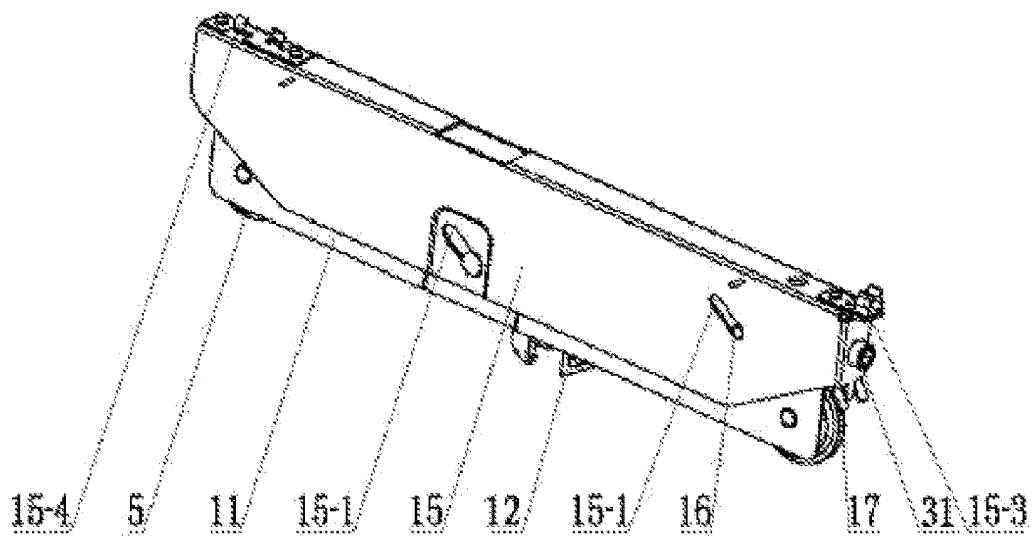


Fig. 6

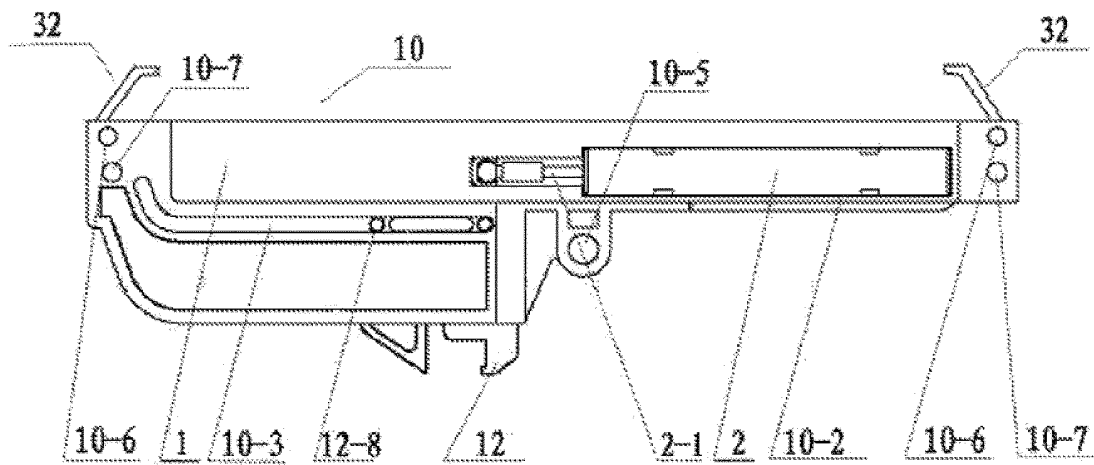


Fig. 7

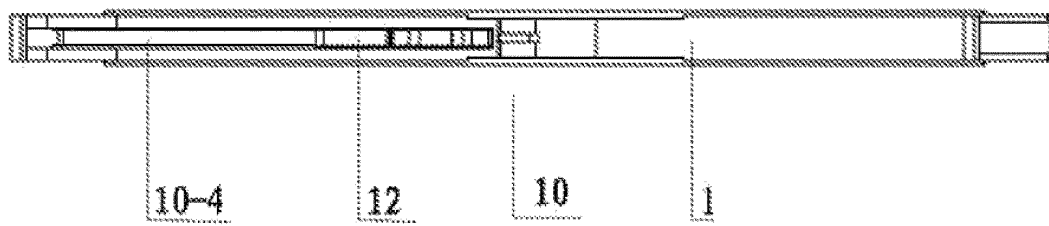


Fig. 8

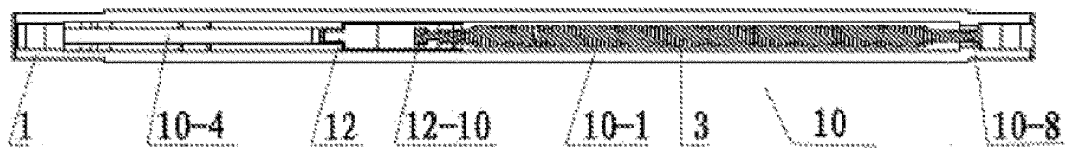


Fig. 9

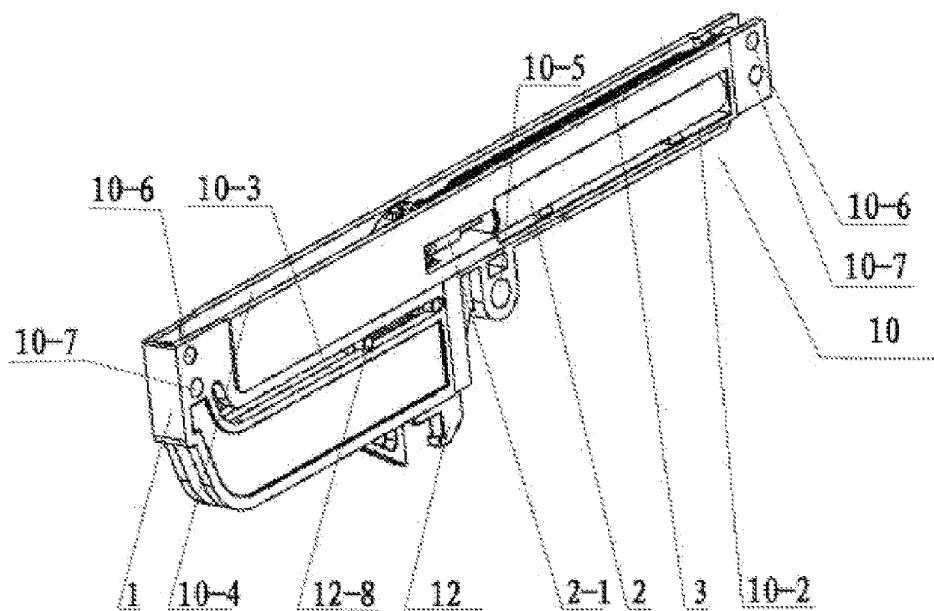


Fig. 10

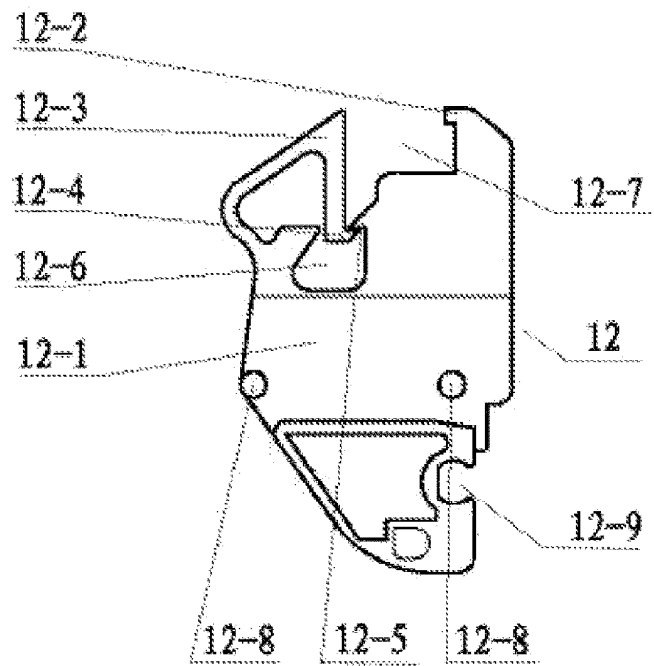


Fig. 11

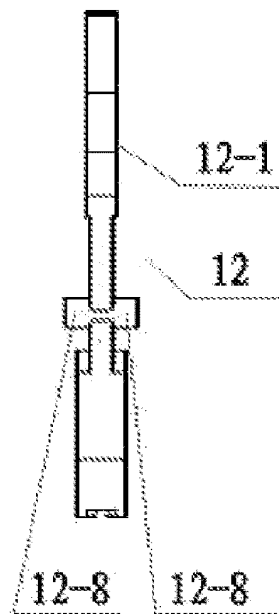


Fig. 12

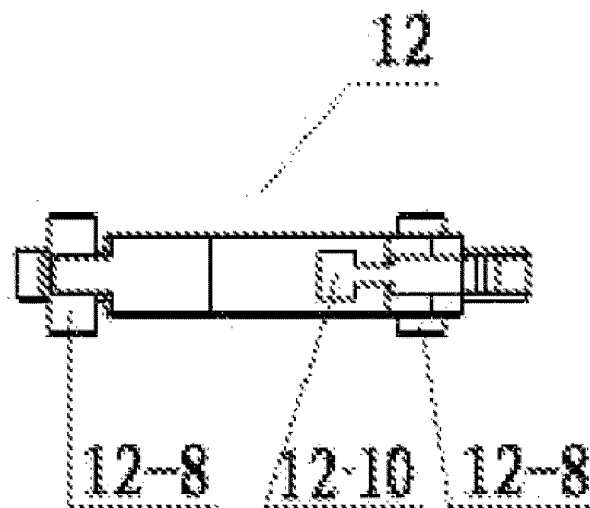


Fig. 13

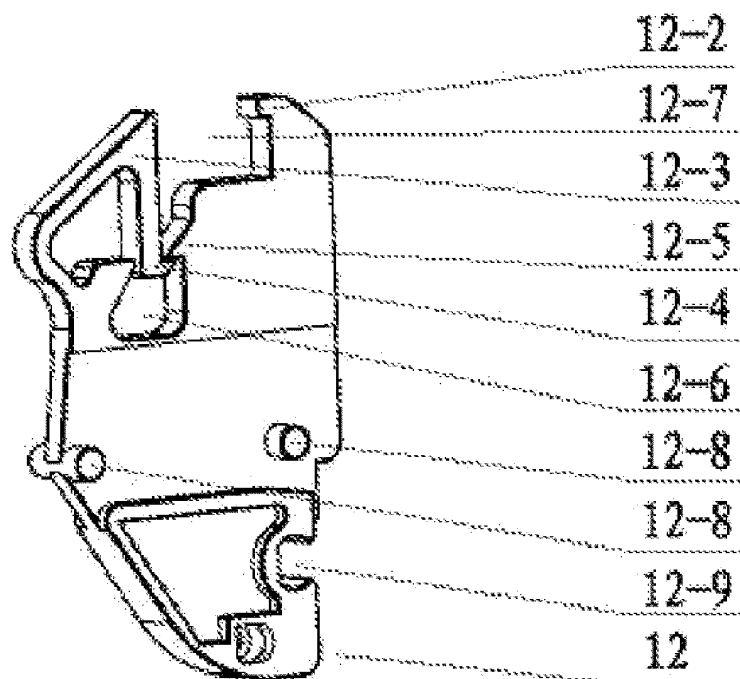


Fig. 14

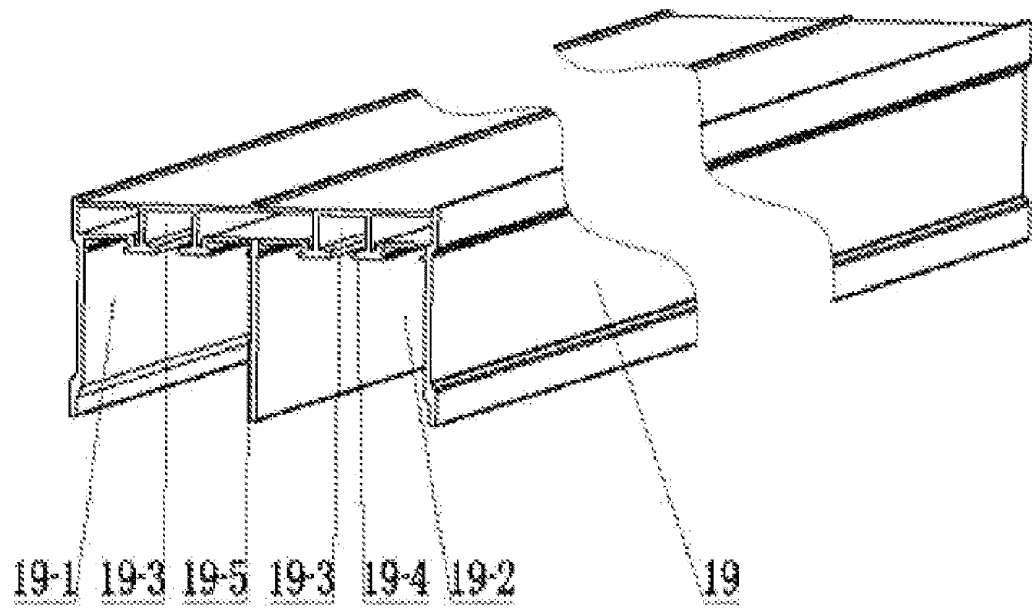


Fig. 15

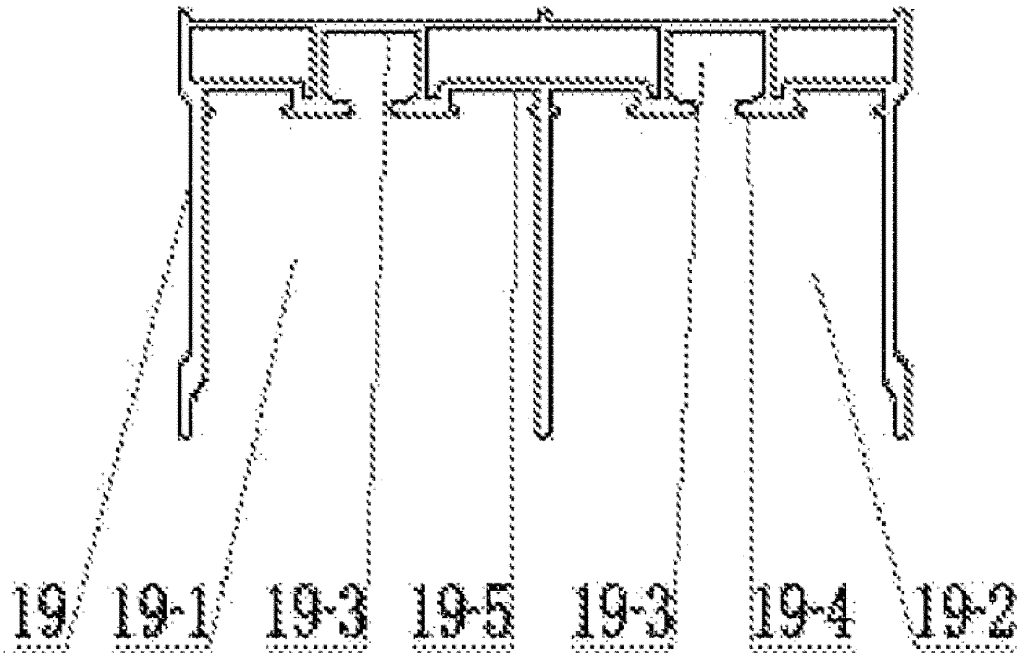


Fig. 16

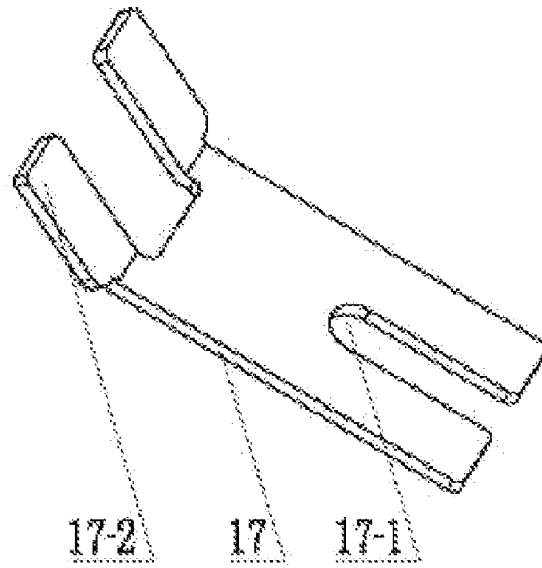


Fig. 17

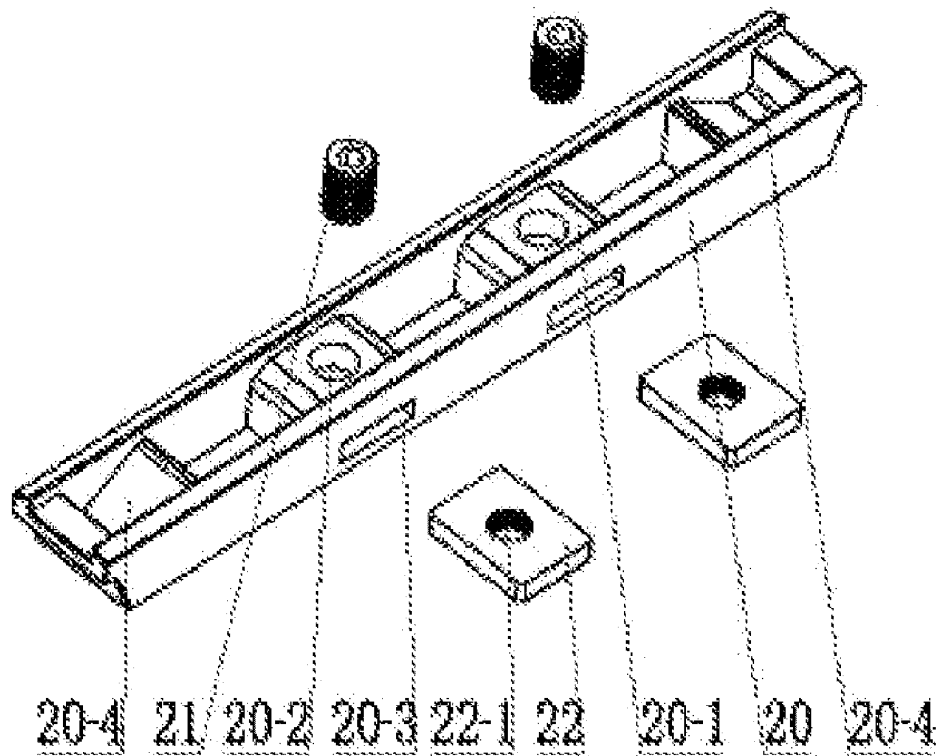


Fig. 18

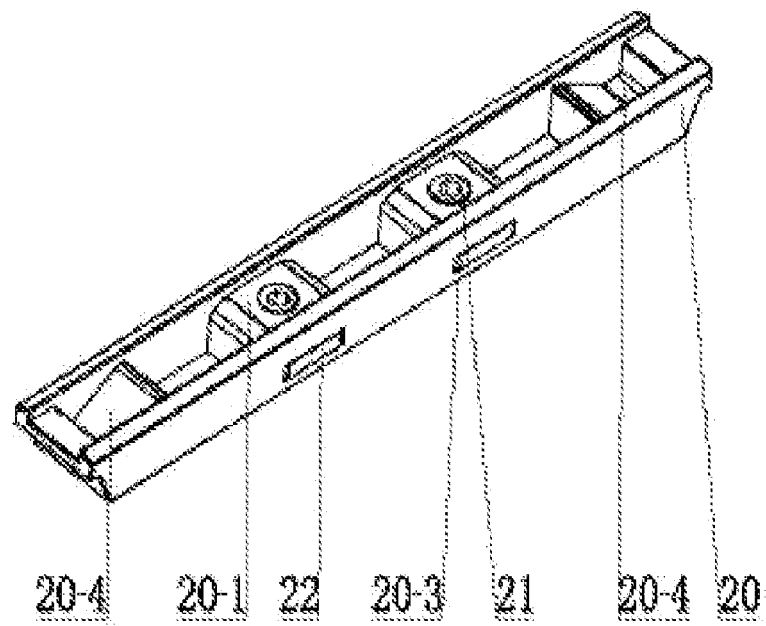


Fig. 19

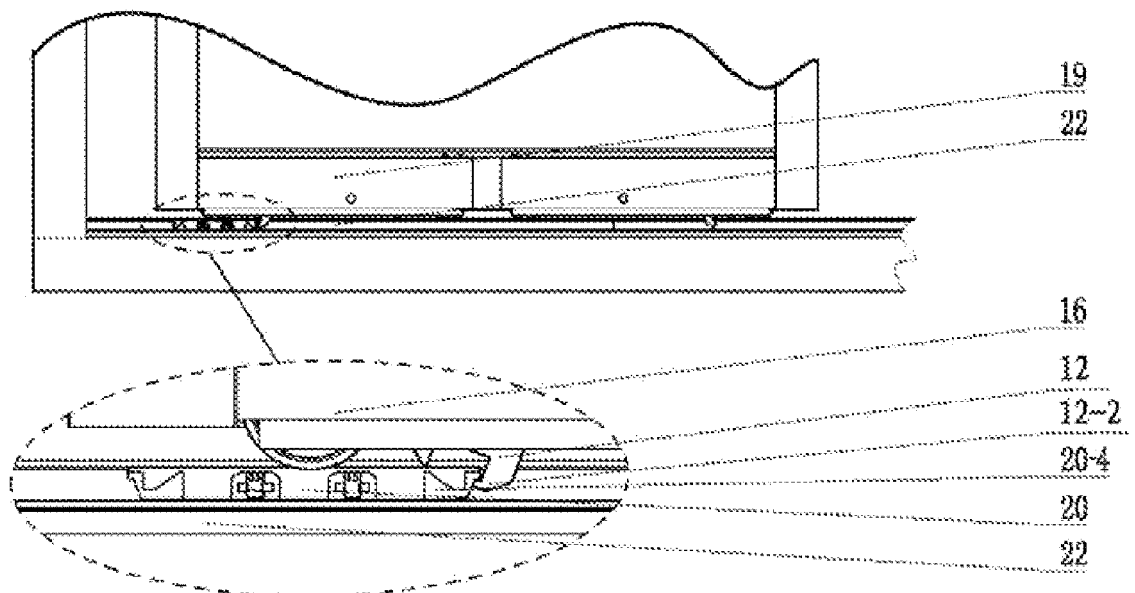


Fig. 20

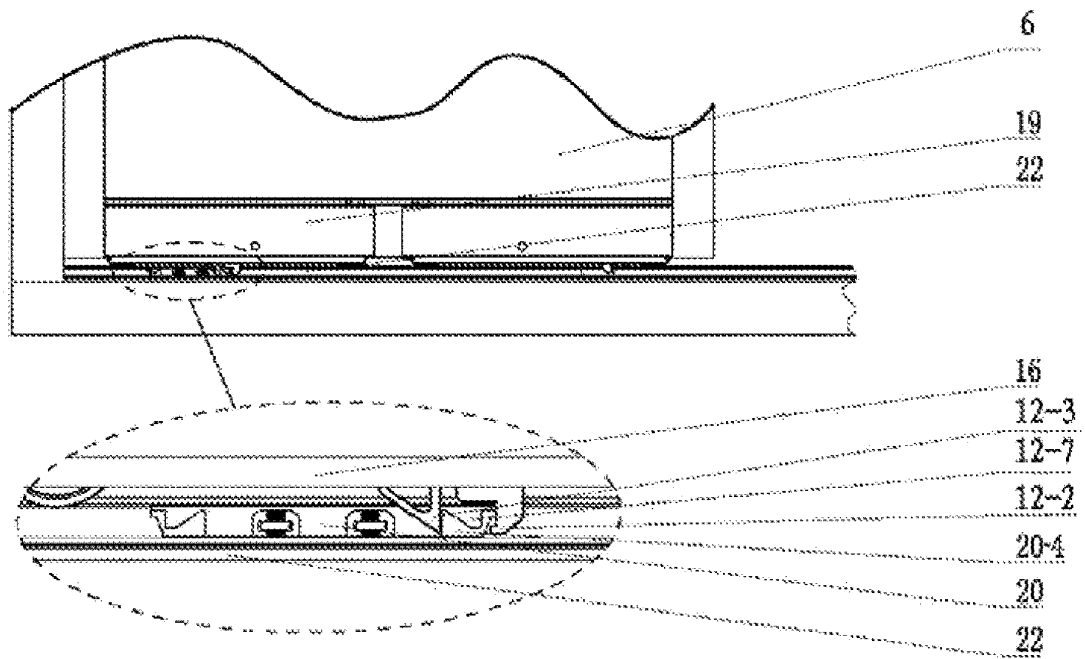


Fig. 21

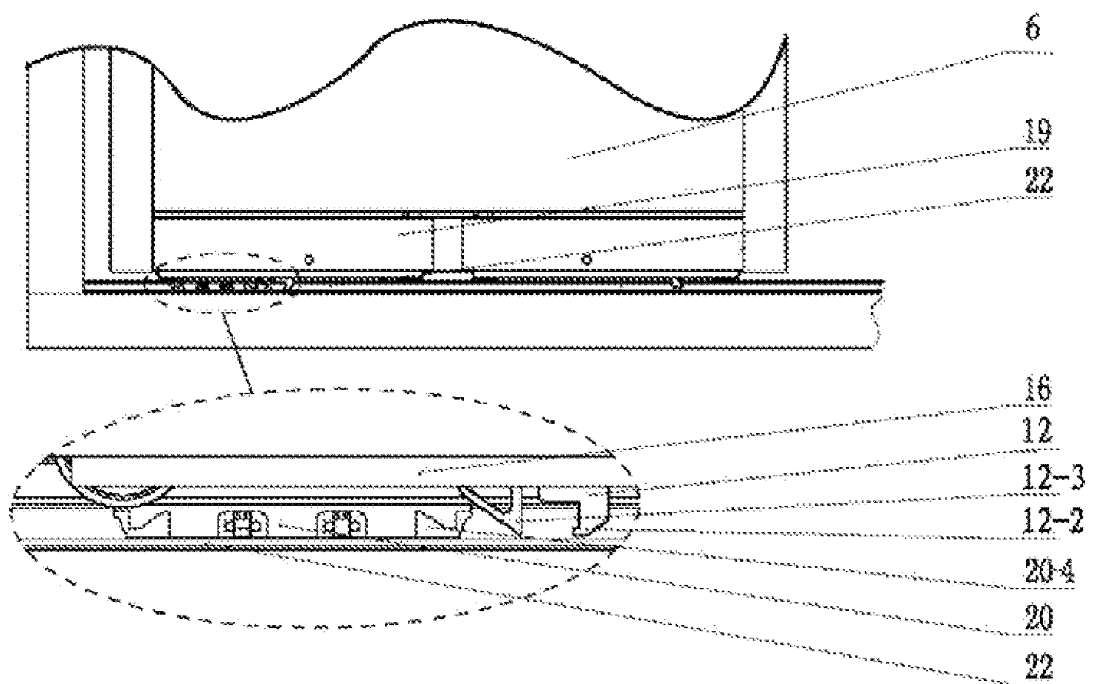


Fig. 22

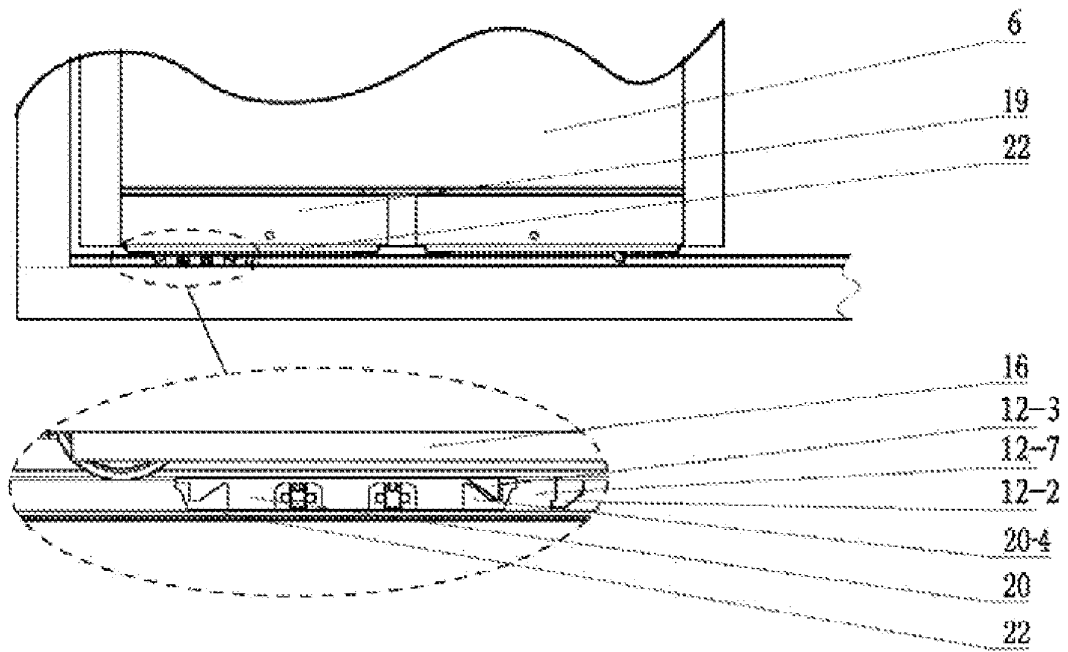


Fig. 23

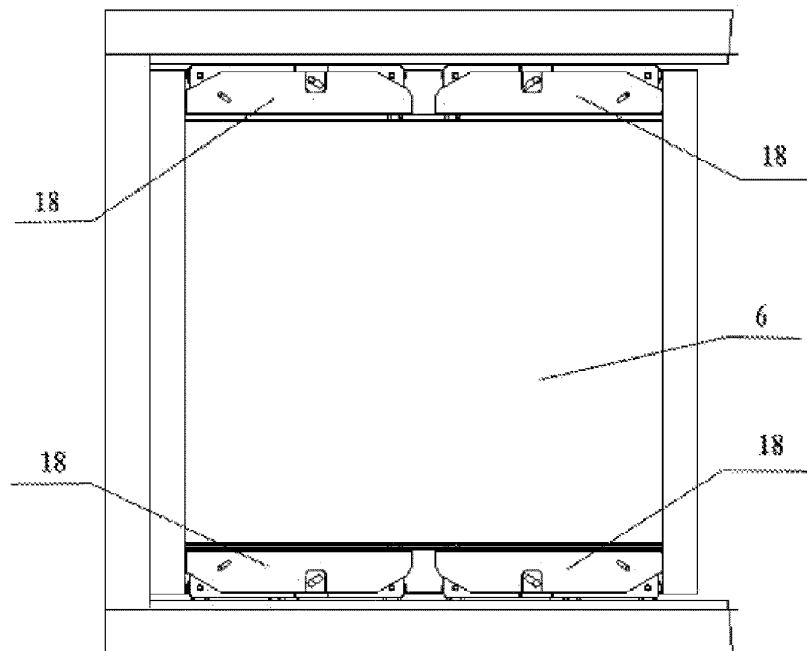


Fig. 24

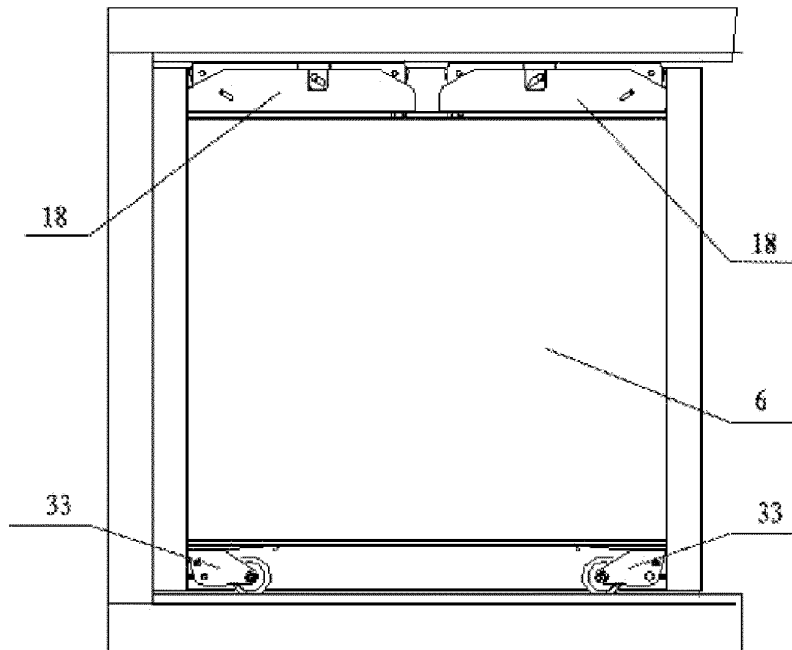


Fig. 26

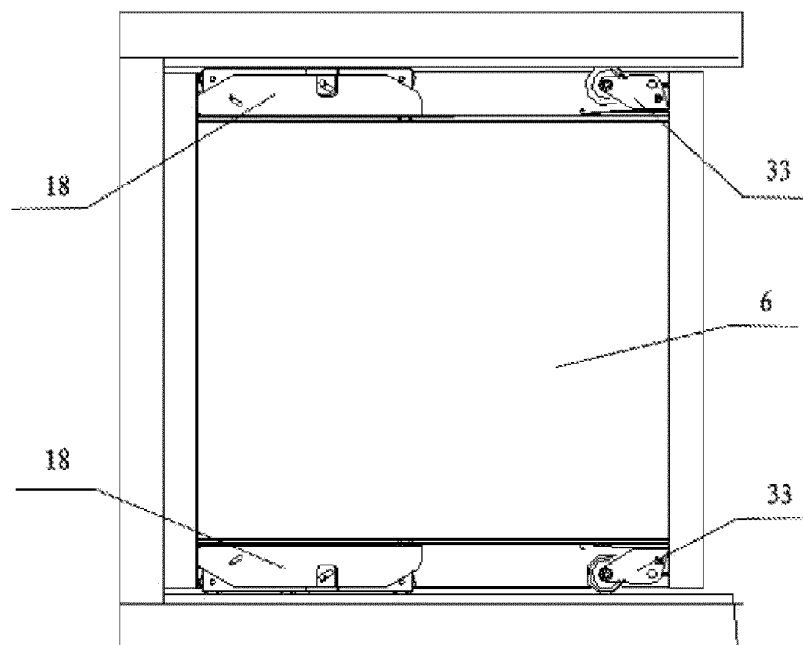


Fig. 27

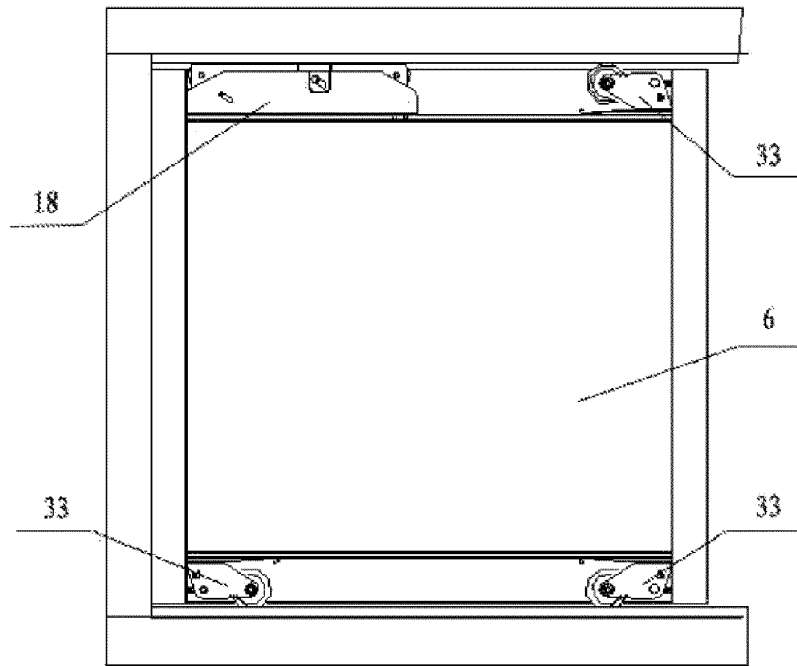


Fig. 28

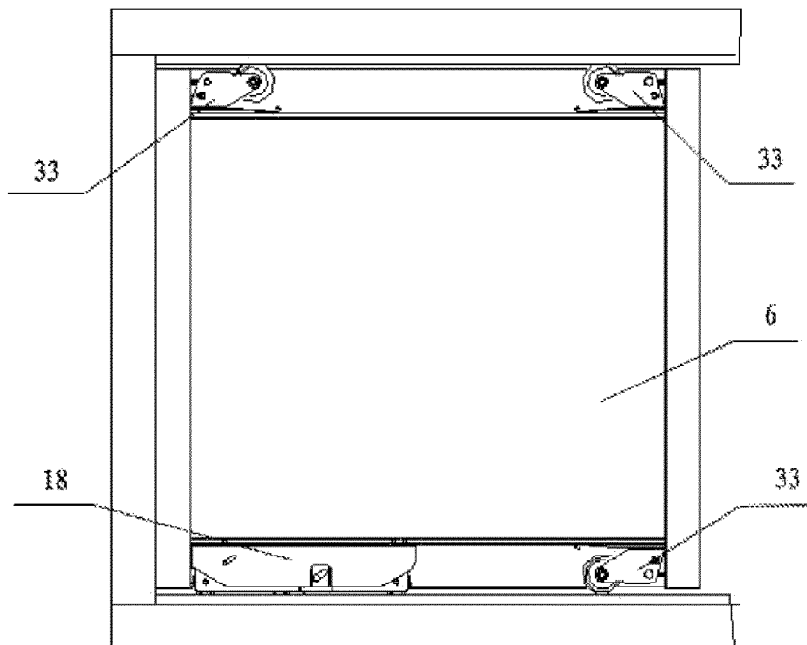


Fig. 29

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/CN2012/073132

## A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC:E05D13/-, E05F5/-, E05D15/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT, CNKI, WPI, EPODOC: clamp, clip, clasp, cleet, holder, grip, folder, damp, spring, wheel, trolley, roll, muller, pulley, drum, block, sheave, truckle, bolt, screw, nail, pin, aperture, hole, opening

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                        | Relevant to claim No. |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| PY        | CN102305002 A(XU, Jiangde), 04 Jan. 2012(04.01.2012), claim 1, description, page 3, paragraph 27 to page 5, paragraph 28, figures 1-13    | 1,2,6-9               |
| Y         | CN2416206 Y(LIN, Jianxiang), 24 Jan. 2001(24.01.2001), description, page 2, lines 1-14, figure 1                                          | 1,2,6-9               |
| A         | DE20212761 U1(HENKE PAUL GMBH & CO KG), 08 Jan. 2004.(08.01.2004), the whole document                                                     | 1-9                   |
| PY        | CN202164910 U(XU, Jiangde), 14 Mar. 2012(14.03.2012), claims 1-3, description, page 3, paragraph 28 to page 5, paragraph 29, figures 1-13 | 1,2,6-9               |

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

|                                                                                                                                                                         |                                                                                                                                                                                                                                                  |
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| "E" earlier application or patent but published on or after the international filing date                                                                               | "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
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| "P" document published prior to the international filing date but later than the priority date claimed                                                                  |                                                                                                                                                                                                                                                  |

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Date of the actual completion of the international search<br>20 Jun. 2012(20.06.2012)                                                                                                                        | Date of mailing of the international search report<br>12 Jul. 2012(12.07.2012) |
| Name and mailing address of the ISA<br>State Intellectual Property Office of the P. R. China<br>No. 6, Xitucheng Road, Jimenqiao<br>Haidian District, Beijing 100088, China<br>Facsimile No. (86-10)62019451 | Authorized officer<br>ZHAO, Jie<br>Telephone No. (86-10) 62085192              |

Form PCT/ISA /210 (second sheet) (July 2009)

**INTERNATIONAL SEARCH REPORT**  
Information on patent family membersInternational application No.  
PCT/CN2012/073132

| Patent Documents referred<br>in the Report | Publication Date | Patent Family | Publication Date |
|--------------------------------------------|------------------|---------------|------------------|
| CN102305002 A                              | 04.01.2012       | NONE          |                  |
| CN2416206 Y                                | 24.01.2001       | NONE          |                  |
| DE20212761 U1                              | 08.01.2004       | NONE          |                  |
| CN202164910 U                              | 14.03.2012       | NONE          |                  |

Form PCT/ISA/210 (patent family annex) (July 2009)

**INTERNATIONAL SEARCH REPORT**

International application No.  
PCT/CN2012/073132

A. CLASSIFICATION OF SUBJECT MATTER:

E05D13/00(2006.01) i

E05F5/08(2006.01) i

E05D15/00(2006.01) n