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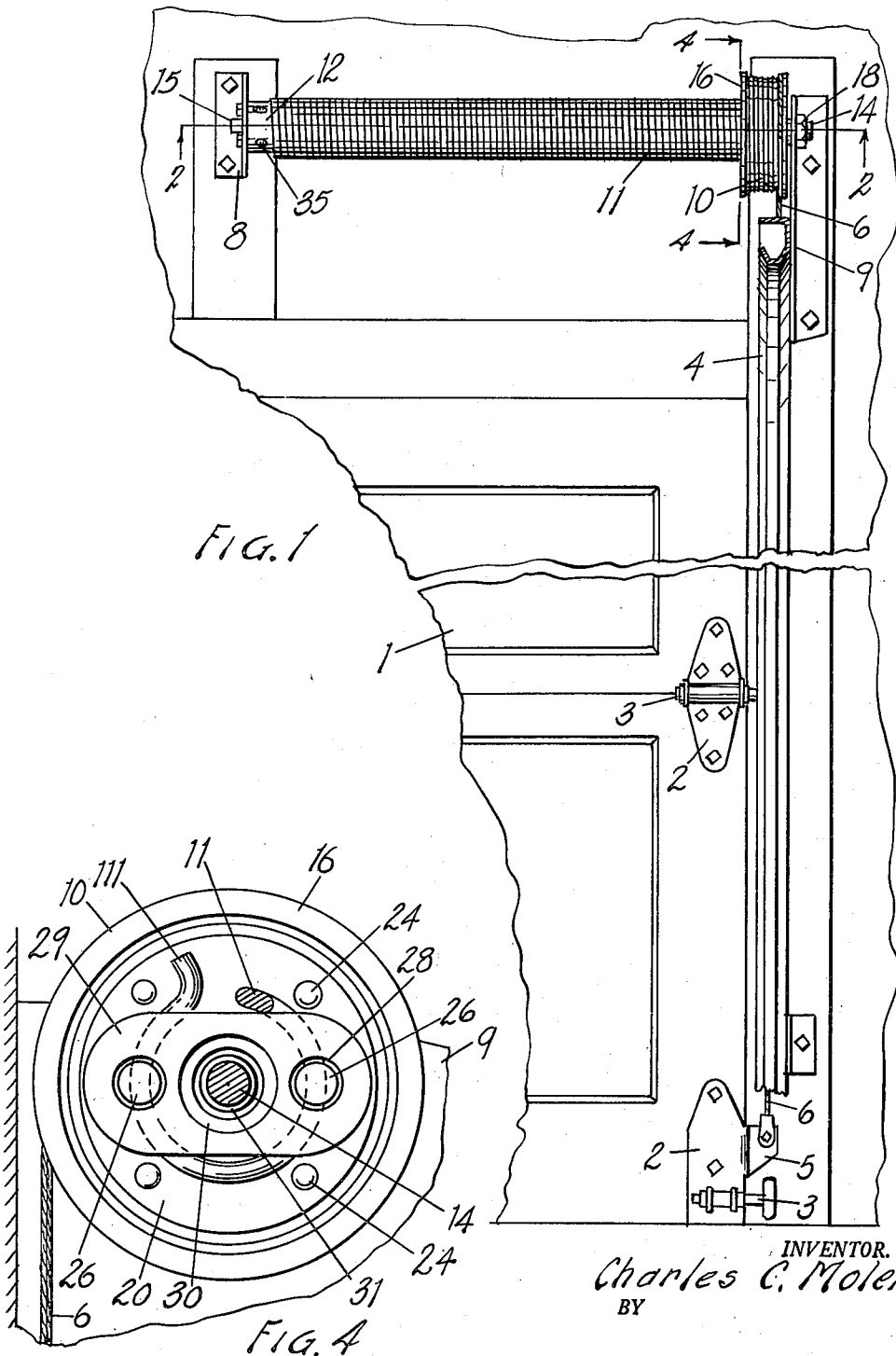
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2,660,753

COUNTERBALANCE FOR VERTICALLY SLIDING DOORS

Filed March 8, 1951

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

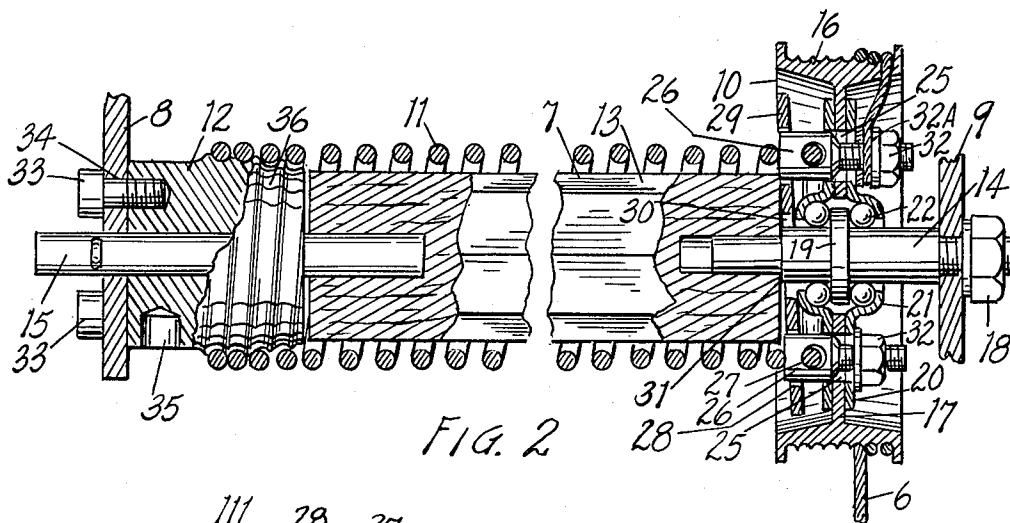


FIG. 2

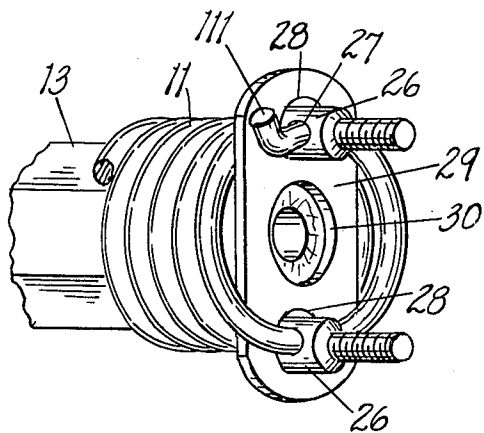


FIG. 3

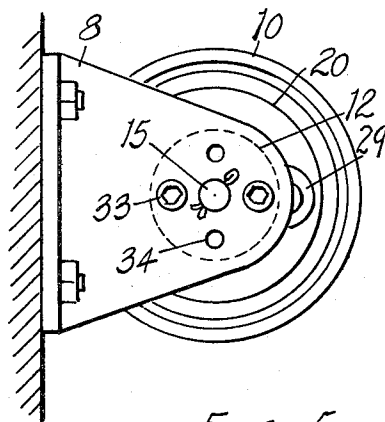


FIG. 5

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UNITED STATES PATENT OFFICE

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COUNTERBALANCE FOR VERTICALLY
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This invention relates to improvements in counterbalance for vertically sliding doors.

The principal objects of this invention are:

First, to provide an economical and simplified counterbalance of the coiled torsional spring type for vertically sliding doors.

Second, to provide counterbalance structure having a minimum number of parts in which the spring supporting structure coacts with the drum of a door supporting cable to maintain the drum in proper alignment.

Third, to provide a novel and inexpensive form of cable drum which is easily mounted and connected to a coiled counterbalance spring.

Fourth, to provide novel means for connecting a coiled torsional spring to the cable drum of a door counterbalancing structure.

Fifth, to provide a counterbalance structure of the torsional coil spring variety for vertically sliding doors which is easily adjusted to proper tension and which is sturdy and long lived in operation.

Other objects and advantages of my invention will be apparent from a consideration of the following description and claims.

The drawings, of which there are two sheets, illustrate the preferred form of my counterbalance structure operatively associated with a door of the vertically sliding type.

Fig. 1 is a fragmentary inside elevational view of a vertically sliding door with my counterbalance structure operatively connected thereto.

Fig. 2 is an enlarged elevational view of the counterbalance structure partially broken away in longitudinal cross section along the plane of the line 2-2 in Fig. 1.

Figure 3 is a fragmentary perspective view of the end of the counterbalance spring and its support ready to be connected to the drum of the door supporting cable.

Figure 4 is a fragmentary cross sectional view through the drum supporting spindle taken along the plane of the line 4-4 in Fig. 1.

Figure 5 is an end elevational view of the support and adjusting connections for the fixed end of the spring.

In Figure 1 I have illustrated portions of a conventional type of vertically sliding door. These include the door 1 having supporting hinge and guide brackets 2 secured along the edge thereof. The guide brackets carry pins 3 for supporting rollers in the guide track 4 as is common in doors of this type, and one of the brackets 2 carries a laterally extending support flange or bracket 5 to which a counterbalancing suspension cable 6 is

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attached. The cable extends upwardly to the counterbalancing structure indicated generally at 7 to sustain most of the weight of the door and facilitate its opening and closing motion.

The counterbalancing structure 7 which constitutes my invention consists of a pair of flanged supporting brackets 8 and 9 which are fixedly secured to the wall in laterally spaced relationship above the door 1. The major elements of the counterbalance structure include a drum 10 for taking up and paying out the cable 6, a coiled torsional spring 11 which is attached to the drum to store up energy as the door is lowered and thus counterbalances the weight of the door, an anchor block 12 for adjustably supporting the fixed end of the spring 11, and an inner wooden spacing core 13 which prevents buckling of the spring 11 intermediate of its ends. The drum 10 and the right end of the counterbalance structure was rotatably supported from the right bracket 9 by a stub shaft or spindle 14 and the left end of the structure and the anchor block 12 are supported from the left bracket 8 by a pin 15.

Considering the construction of the drum 10 and its connection to the spring 11 in greater detail it will be noted that the drum includes an outer cylindrical rim portion 16 which is spirally grooved to take up and pay out the cable in neat coils. The interior portion of the drum consists of a wheel-like disc 17 formed integrally with the rim and apertured at the center to pass the spindle 14. The spindle 14 which is fixedly secured to the bracket 9 by the nut 18 is provided with an annular flange or collar 19 located within the aperture in the disc 17 of the drum. Fixedly secured at opposite sides of the disc 17 are a pair of hub plates 20 which are provided with oppositely and inwardly concave hub flanges 21 projecting radially inwardly of the aperture in the disc 17. The hub flanges 21 form ways or retainers for a plurality of ball bearings 22 which are thus retained on opposite sides of the collar 19. Quite obviously the drum 10 and supporting spindle 14 are initially and permanently assembled together as a unit by the permanent attachment of the hub plate 20 to the disc 17. Rivets 24 secure the elements of the drum structure together as is best shown in Figure 4.

The disc 17 and hub plates 20 of the drum are formed with two diametrically opposed holes 25 extending completely therethrough to pass the threaded ends of a pair of anchor pins 26. On their axially inner ends the pins 26 are enlarged and provided with transverse bores 27 so that the

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pins may be threaded successively over the right end of the torsional spring 11. Prior to being threaded over the spring 11 the inner ends of the pins 26 are engaged in holes 28 in the opposite ends of a lock plate 29 and the plate and pins are then threaded onto the spring in a twisting motion so that the outer end coil of the spring retains the plate 29 axially while the engagement of the inner ends of the pins 26 within the holes 28 prevents removal of the plate transversely of the spring. The plate 29 is provided with a central aperture 30 which passes the inner end of the spindle 14.

The free or inner end of the spindle 14 is shouldered as at 31 to press against and extend into the center of the spring spacing core 13. Sufficient room is provided between the inner hub flange 21 of the drum and the end of the core to pass the anchor plate 29 as is most clearly illustrated in Figure 2. The spindle 14 thus rotatably supports the drum, core and spring while the axial pressure of the spring urges the anchor plate 29 and pins 26 outwardly through the holes 25 in the disc portion of the drum to drivingly connect the drum to the end of the spring. Nuts 32 serve to draw the pins 26 outwardly until the outer coil of the spring 11 is clamped against the inner side of the drum. One of the nuts and pins 32 serves as an anchor for the upper end of the cable 6 which is passed radially inwardly through a hole in the flange 16 and wrapped around the pin as indicated at 32-A Fig. 2.

Turning now to the support and connections at the fixed end of the spring it will be noted that the anchor block 12 is rotatable about the pin 15 but is capable of being secured in different rotated adjusted positions by anchor screws 33 passed inwardly through holes 34 in the supporting bracket 8. The anchor block is further provided with a series of radially extending holes or sockets 35 which are adapted to receive a spanner wrench for rotating the anchor block against the torsional pull of the spring 11 to pre-load the spring. After pre-loading of the spring the screws 33 are inserted to hold the anchor block in place. The inner end of the anchor block is provided with a tapered spiral screw portion 36 which is threaded into the fixed end of the spring and forms a spring clutch connection therewith.

The pin 15 which supports the anchor block 12 extends through the block into the end of the spacing core 13 so that the pin 15, core 13, and spindle 14 are mutually self-supported in alignment within the spring 11. The core 13 may be made of wood as shown or inexpensive pipe or conduit for light weight and is not subjected to any great loads by the operation of the counterbalance structure.

Desirably, the end of the spring 11 that engages the pins 26 is bent from the circular shape of the body of the spring as at 111 to prevent the spring from twisting out of the holes 27 should the nuts 32 be insufficiently tightened. The holes 27 are made large enough to permit the threading of the pins over the bent end of the spring during assembly but once the pins are engaged through the drum 10 they will not twist or tilt sufficiently to permit unintentional unthreading of the spring from the pins.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. Spring counterbalance structure for a ver-

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tically movable door comprising, a pair of supporting brackets adapted to be mounted in transversely spaced relationship above said door, a spindle fixedly secured to one of said brackets and located to one side of said door, a collar on said spindle forming an inner bearing guide, a drum rotatably mounted on said spindle and including an inner hub portion retaining ball bearings on each side of said collar, said drum including a radially extending disc portion defining diametrically opposite located holes and an outer cable supporting rim, a pin supported by the other of said brackets and extending in aligned position toward said spindle, a spring supporting core extending between and supported by said spindle and said pin, an anchor block rotatably adjustably mounted on said pin, means for securing said block to said other bracket in adjusted position, a coiled torsion spring disposed around said core and having one end fixed to said block, an anchor plate positioned between the first and second turns of the other end of said spring and having holes formed therethrough in its center and opposite the sides of said outer turn of said spring with the center hole passing said spindle, anchor pins having their inner ends received in the end holes in said anchor plate and forming transverse apertures through which the outer turn of said spring is passed, said anchor pins extending through the holes in the disc portion of said drum, and nuts on the other ends of said anchor pins clamping the outer turn of said spring against the inner side of said drum, one of said anchor pins and nuts forming an anchor attachment for a supporting cable adapted to be coiled around said drum and adapted to extend downwardly and be connected to said door, said other end of said spring having a hooked tip to prevent said spring from twisting out of engagement with said pins.

2. Spring counterbalance structure for a vertically movable door comprising, a pair of supporting brackets adapted to be mounted in transversely spaced relationship above said door, a spindle fixedly secured to one of said brackets and located to one side of said door, a collar on said spindle forming an inner bearing guide, a drum rotatably mounted on said spindle and including an inner hub portion retaining ball bearings on each side of said collar, said drum including a radially extending disc portion defining a hole radially spaced from its center and an outer cable supporting rim, a pin supported by the other of said brackets and extending toward said spindle, a spring supporting core extending between and supported by said spindle and said pin, an anchor block rotatably adjustably mounted on said pin, means for securing said block to said other bracket in adjusted position, a coil spring disposed around said core and having one end fixed to said block, an anchor plate positioned between the first and second turns of the other end of said spring and having holes formed therethrough, one passing said spindle and another opposite the outer turn of said spring, an anchor pin having its inner end received in the outer hole in said anchor plate and forming a transverse aperture through which the outer turn of said spring is passed, said anchor pin extending through the hole in said disc portion of said drum, a nut on the other end of said anchor pin clamping the outer turn of said spring against the inner side of said drum.

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3. Spring counterbalance structure for a vertically movable door comprising, a pair of supporting brackets adapted to be mounted in transversely spaced relationship above said door, a spindle fixedly secured to one of said brackets and located to one side of said door, a drum rotatably mounted on said spindle and axially fixed thereon, said drum including a radially extending disc portion defining a hole radially spaced from its center and an outer cable supporting rim, a pin supported by the other of said brackets and extending toward said spindle, a spring supporting core extending between and supported by said spindle and said pin, an anchor block rotatably adjustably mounted on said pin, means for securing said block to said other bracket in adjusted position, a coiled spring disposed around said core and having one end fixed to said block, an anchor pin having a transverse aperture through which the outer turn of said spring is passed, said anchor pin extending through the hole in said disc portion of said drum, a nut on the other end of said anchor pin clamping the outer turn of said spring against the inner side of said drum.

4. Counterbalance structure for a vertically movable door having a supporting cable attached thereto comprising, a pair of brackets fixedly supported above said door, pins projecting inwardly from said brackets, a spring supporting core supported between and aligning the inner ends of said pins, an anchor block rotatably adjustably mounted on one of said pins, a drum rotatably mounted and axially fixed on the other of said pins and adapted to be connected to said cable to wind up the same, a coil spring sleeved around said core and having one end connected to said block, and means including pins passed axially through said drum and connected to the other end of said spring for drivingly connecting said drum to said spring, said connecting pins having recesses embracing said spring, and clamping nuts on the opposite ends of said pins from said spring for clamping the end of the spring axially against said drum, said other end of said spring having a hooked tip to prevent said spring from twisting out of engagement with said pins.

5. Counterbalance structure for a vertically movable door having a supporting cable attached thereto comprising, a pair of brackets fixedly supported above said door, pins projecting inwardly from said brackets, a spring supporting core supported between and aligning the inner

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ends of said pins, an anchor block rotatably adjustably mounted on one of said pins, a drum rotatably mounted on the other of said pins and adapted to be connected to said cable to wind up the same, a coil spring sleeved around said core and having one end connected to said block, and means connected to the other end of said spring for drivingly connecting said drum to said spring, said connecting means having portions overlapping the end turn of said spring and clamping nuts for clamping the end of the spring axially against said drum.

6. Counterbalance structure for a vertically movable door having a supporting cable attached thereto comprising, a pair of brackets fixedly supported above said door, pins projecting inwardly from said brackets, a spring supporting core supported between and aligning the inner ends of said pins, an anchor block rotatably adjustably mounted on one of said pins, a drum rotatably mounted on the other of said pins and adapted to be connected to said cable to wind up the same, a coil spring sleeved around said core and having one end connected to said block, and means connected to the other end of said spring for drivingly connecting said drum to said spring.

7. Counterbalance structure for a vertically movable door having a supporting cable comprising, a drum rotatably mounted and adapted to take up said cable in the elevated position of the door, a coil spring mounted in generally coaxial alignment with said drum with one end positioned adjacent to said drum and with its other end fixed, means for securing the free end of said spring to said drum including an anchor pin having a transverse recess through which the end turn of said spring extends, said pin extending axially of said drum through a hole provided therefor in a portion of said drum spaced radially from its axis of rotation, and a nut threaded on said pin on the opposite end of said drum from said spring and clamping the end of said spring against said drum.

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