Sept. 30, 1941. A. V. ROWE 2,257,484

OVERHEAD DOOR CONSTRUCTION

Filed Nov. 1, 1939 3 Sheets-Sheet 1

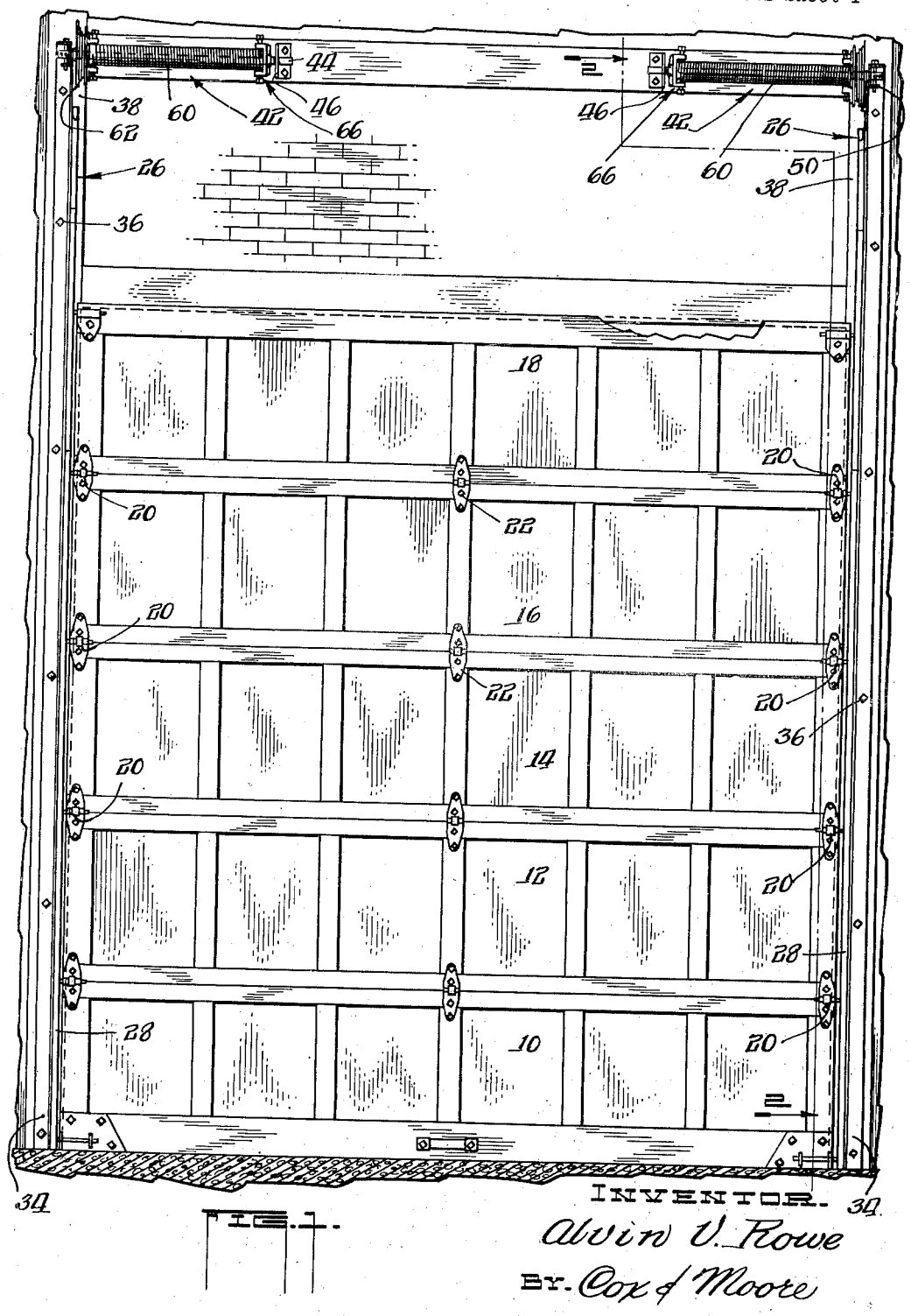


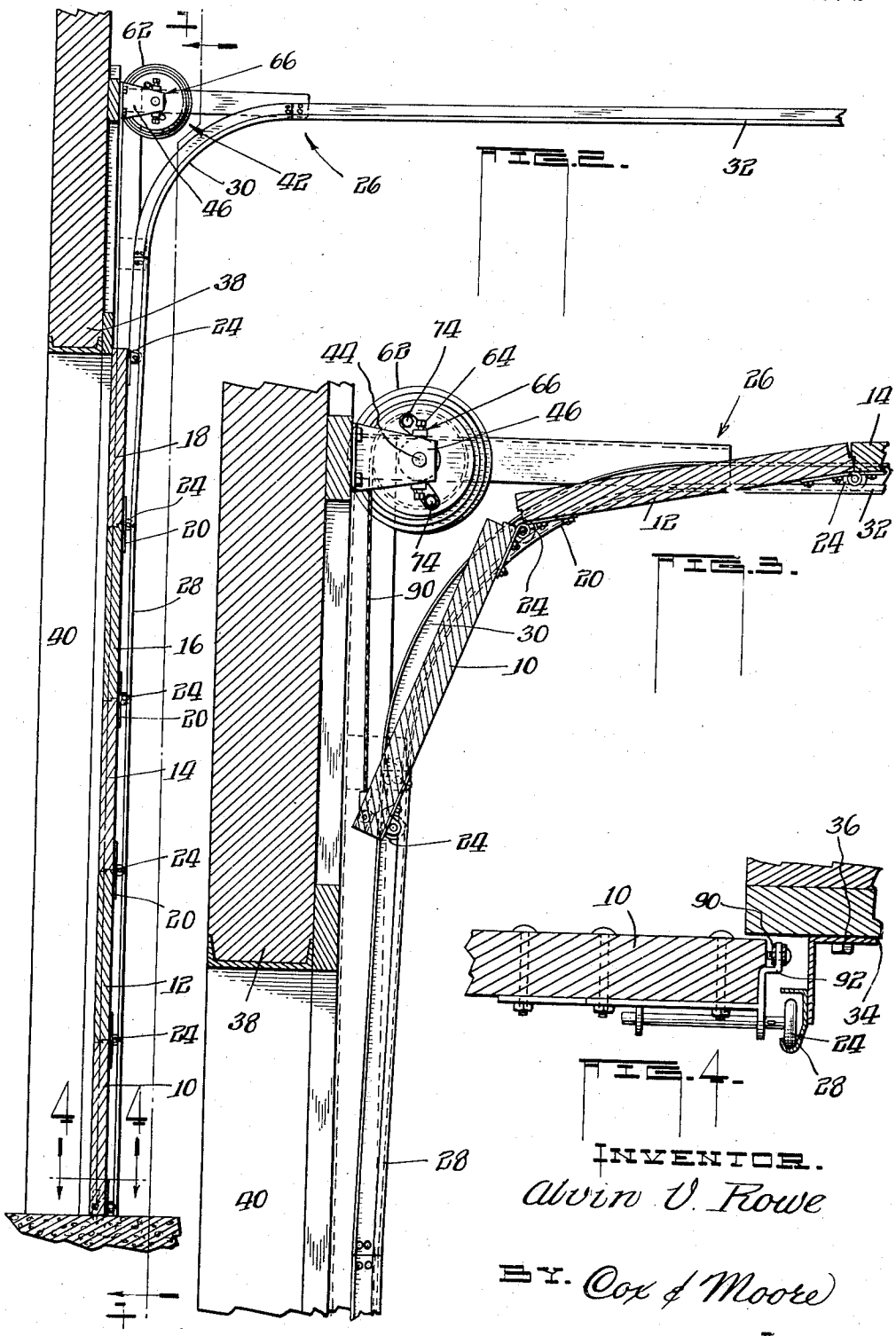
FIG. 1.

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OVERHEAD DOOR CONSTRUCTION

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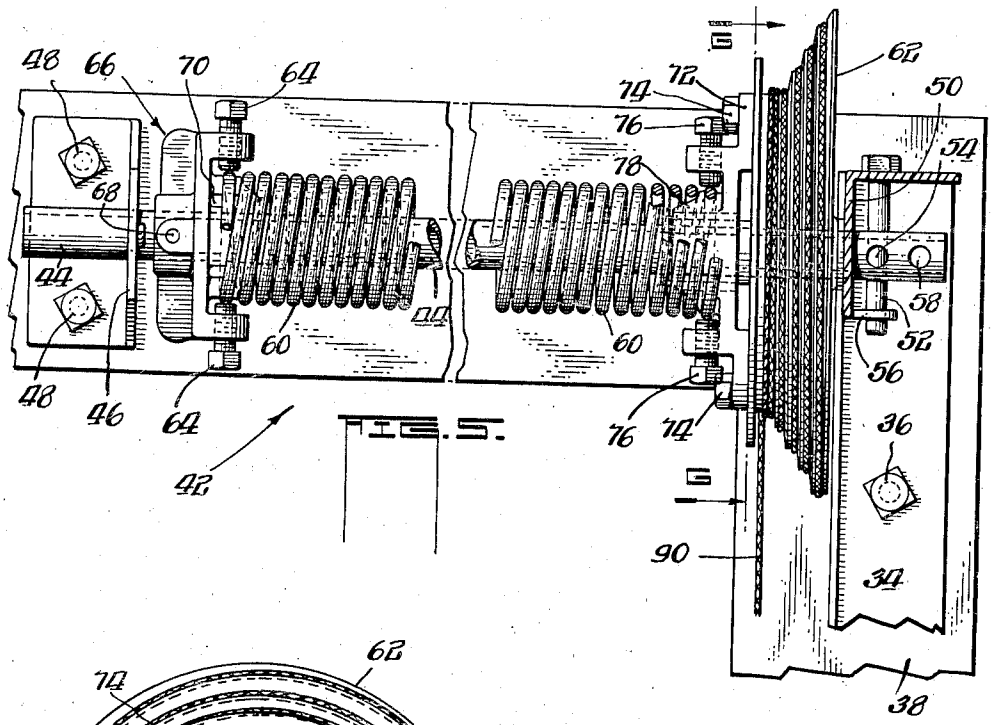


FIG. 5.

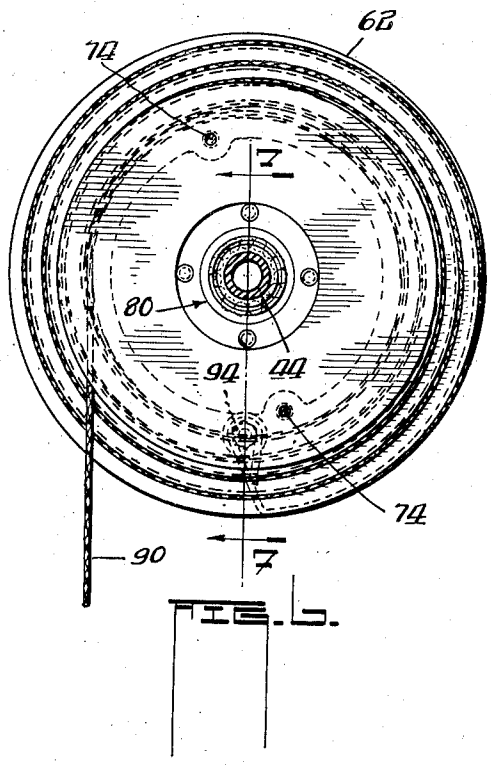


FIG. 6.

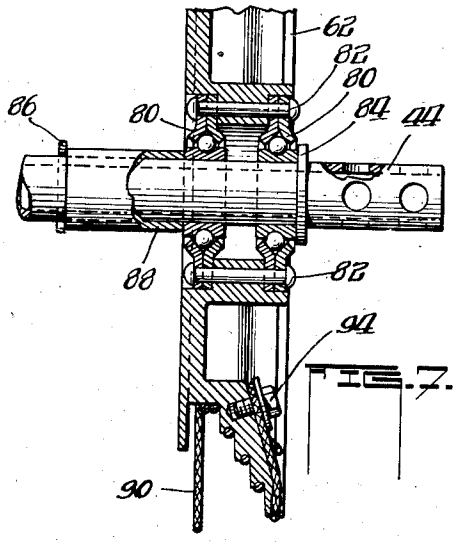


FIG. 7.

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UNITED STATES PATENT OFFICE

2,257,484

OVERHEAD DOOR CONSTRUCTION

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Application November 1, 1939, Serial No. 302,396

6 Claims. (Cl. 20—20)

This invention relates generally to overhead door constructions and more particularly to overhead door constructions equipped with double, torsion type, counterbalancing springs.

Certain of the conventional overhead door constructions, with which I am familiar, equipped with double, torsion type, counterbalancing springs, present disadvantages and inconveniences which the present invention obviates. For example, certain of these conventional constructions are difficult to adjust in that they require the removal of one of the door panels or the glass from one of the door sections in order to adjust the tension of the springs. Adjustment of such springs can only be made when the door panels occupy their open or overhead position because the springs experience the least tension when the panels occupy this position.

The present invention contemplates a very simple tension adjusting mechanism which is conveniently accessible and does not require the removal or displacement of any door parts or panels in order to effect the tension adjustment.

More specifically, the present invention contemplates a tension adjusting arrangement wherein a normally fixed shaft or spindle, which supports the lifting drum and torsion spring, may be rotated from a conveniently located and accessible position for the purpose of adjusting the tension of the torsion spring.

Another disadvantage which I have found in some overhead door installations is an arrangement of bearings for the rotary, torsion-spring supporting spindle which makes it difficult to maintain alignment of the bearings and hence often introduces increased friction and the consequent binding thereof. The present invention contemplates an overhead door construction wherein the revolving type of torsion-spring spindle or shaft is supplanted by a fixed, or what is sometimes referred to as a "dead" shaft, having in association therewith bearings of improved novel design which will insure continued alignment.

Another object of the present invention is to provide an overhead door construction wherein the counterbalancing spring mechanism has a bearing arrangement which precludes deleterious lateral distortion of the sheave and torsion-spring supporting shaft, and to this end I propose to provide an antifriction bearing, preferably of the double-race ball bearing variety, the bearings being so disposed as to experience an even or equalized force resulting from the pulling force exerted by the flexible door lifting element, cable, or the like.

The foregoing and numerous other objects and advantages will be apparent from the following detailed description when considered in connection with the accompanying drawings, wherein

Figure 1 is an elevational view of an overhead door construction of my improved design, said view being taken from the inside of a garage structure substantially along the line 1—1 of Figure 2;

Figure 2 is a vertical sectional view taken substantially along the line 2—2 of Figure 1, the right extremity of the horizontal track sections being broken away;

Figure 3 is an enlarged fragmentary vertical sectional view of the upper left-hand portion of the door structure as shown in Figure 2, the door panels being disclosed in their open or overhead position;

Figure 4 is an enlarged fragmentary horizontal sectional view taken along the line 4—4 of Figure 2, to more clearly illustrate the manner in which the lifting element or cable is secured to the lowermost door panel;

Figure 5 is an enlarged elevational view of the torsion-spring mechanism as shown in the upper right-hand portion of Figure 1, the intermediate section of the spring and associated parts being broken away to facilitate a complete disclosure of the supporting bearings, etc., positioned at opposite extremities of the spring supporting shaft or spindle;

Figure 6 is a vertical sectional view taken substantially along the line 6—6 of Figure 5; and

Figure 7 is a fragmentary view of the cable supporting drum or sheave and its associated bearing structure, the drum being shown in section to more clearly illustrate the details of its bearing support.

Referring now to the drawings more in detail, wherein like numerals have been employed to designate similar parts throughout the various figures, it will be seen that my invention contemplates an overhead door construction wherein a plurality of door panels 10, 12, 14, 16 and 18 are adapted to be shifted between a vertical door closing position and an open overhead position. These panels 10—18 are connected by suitable hinges 20 positioned along the opposite outer margins and central hinge members 22.

Each of the hinge members 20 carries a guide roller 24 which cooperates with complementary tracks 26. Each track section 26 includes a substantially vertical or upright track section 28, an

intermediate or curved section 30, and an overhead, substantially horizontal section 32. The track sections 28 are fixed to a vertical support 34. This support 34 constitutes an angle-iron which is fastened by means of suitable lag screws 36 to the inner surface of the door frame of jamb 38.

When the door panels occupy the vertical position shown in Figures 1 and 2, they serve to close the door opening 40 which is defined by the door frame structure 38. The door panels may be vertically shifted from the door closing position, shown in Figures 1 and 2, to the open or overhead position shown in Figure 3. To facilitate shifting of the door panels between the aforesaid vertical door closing position and open overhead position, I provide counterbalancing spring mechanisms designated generally by the numeral 42. One of these mechanisms is associated with each guide track, and a description of the structural and functional characteristics of one will suffice for both because they are identical in construction.

These counterbalancing spring mechanisms 42 are shown somewhat in detail in Figures 5 to 7, inclusive. Each mechanism includes a supporting shaft or sleeve 44 which is mounted at one extremity (hereinafter referred to as the inner extremity) within a bracket 46, said bracket being secured to the frame structure 38 by means of suitable bolts 48. The opposite extremity of the shaft 44 is supported within a bracket 50 which is mounted at the upper extremity of the vertical support bar or angle-iron 34.

The shaft 44 is normally secured against rotation by a pin 52. This pin is adapted to extend through the horizontal section of the bracket 50 and into complementary apertures 54 provided within the shaft 44. The lower extremity of the pin 52 extends through an aperture provided in a projection or ear 56 formed integral with the bracket 50.

In order to impart rotation to the shaft 44, it is only necessary to force the pin 52 upwardly out of interlocking association with the apertures 54, and then associate a tool or pin to apertures 58 and impart the desired degree of rotation to the shaft.

It will be noted that a torsion type, counterbalanced spring 60 is supported upon the shaft 44, one extremity, namely, the left extremity thereof (Figure 5), being normally secured against rotation, and the opposite extremity being free to turn with a cable drum or sheave 62. The left or inner extremity of the torsion spring 60 is secured in position by means of a pair of oppositely disposed set or clamping screws 64 carried by oppositely disposed arms of a collar-like member designated generally by the numeral 66. This member 66 is fixed to the shaft 44 by means of a suitable set screw or pin 68, and a section 70 formed integral therewith extends within the left extremity of the coil spring so as to provide a support for the inner side of the spring convolution which is engaged by the set or clamping screws 64. This inwardly extending section is preferably provided with a peripheral groove forming a seat for the spring convolution engaged by the screws 64.

The opposite or right extremity of the torsion spring 60 (Figure 5) is secured to a member 72 which rotates as a unit with the cone type drum 62. This member 72 is secured to the drum by means of suitable screws 74. A pair of oppositely disposed clamping or set screws 76 carried by the member 72 serves to clamp a convolution of the spring against a central section 78 of the member 72 which extends within the coil spring structure. The periphery of this section 78 is preferably grooved to receive the spring convolution and thus cooperates with the clamping screws 76 in securing said convolution to the rotary member 72.

Particular attention is directed to the manner in which the drum 62 and the parts associated therewith are mounted upon the shaft 44. This is best disclosed in Figure 7. The drum 62 is carried by a pair of spaced, antifriction or ball bearings 80. The outer races of these bearings 80 are secured to the drum structure by any suitable means, such as rivets 82. The inner race members of the bearings 80 snugly encircle the shaft 44. A washer 84 secured to the shaft 44 prevents axial displacement of the bearings 80 in one direction, namely, to the right (Figure 7), and a stop or cotter pin 86 cooperates with a collar 88 in preventing axial movement of the inner race members in the opposite direction, namely, to the left (Figure 7).

Each drum 62 carries a flexible lifting element or cable 90. The free end of each cable 90 is secured to a bracket 92 carried at the lower margin of the lowermost door panel 10 (Figures 2 and 4). When the door panels occupy the vertical door closing position shown in Figure 1, the cable 90 extends upwardly from the bracket 92 to the periphery of the conical drum 60 and is wound around said drum until the extremity of the cable 90 reaches the point where it is secured, by means of a bolt or screw 94, to an inner surface of the drum.

From the foregoing description, it will be apparent that the springs 60 exert a strong counterbalancing effect upon the panels when said panels occupy their closed or vertical position. Thus, when the panels are released so as to permit upward movement thereof, the springs 60 cooperate in this upward movement by causing the drum to be urged in a direction of rotation which causes the cables 90 to exert an upward pulling force. Likewise, as the door panels are moved downwardly from their open overhead position, the drum 62 is rotated so as to impart rotation to the free or outer extremity of each torsion spring, thereby causing said spring to be placed under increased tension. As previously pointed out, the inner extremity of each torsion spring is secured against rotation upon the shaft 44.

It will be noted that the pulling force exerted by the cables 90 is applied to the shaft 44 at a point closely adjacent the bearing of the shaft within the bracket 50 (Figure 5). In other words, at all times the force exerted by the lifting elements is distributed between the two antifriction or ball bearings 80 which are positioned closely adjacent the mounting bracket 50.

Furthermore, the freedom of rotation of the drum 62 is not dependent upon absolute alignment between the bearings or brackets 46 and 50 because any slight misalignment of these bearings will not affect the true running of the drum upon its independent or individual ball bearing mounting. This is to be distinguished from other conventional types of counterbalancing spring arrangements wherein absolute alignment between the bearings of the supporting shaft is essential to assure ease of operation.

The close or snug fit between the inner races of the bearings 80 and the shaft 44 insures ease

of operation of the drum 62 and reduces to a minimum the tendency for the shaft to experience deleterious bending or lateral displacement.

It is not unusual, in overhead door installations of the type herein described, to require adjustment of the tension in the counterbalancing springs from time to time. In this connection, it will be noted that I provide a very simple means of adjustment. By having the apertures 54 and 53 (Figure 5) arranged as described, the tension in the spring 60 may be adjusted by temporarily disengaging the locking pin or bolt 52 from the pair of apertures 54, and then engaging a tool or pin within the apertures 58 and imparting the desired degree of rotation in either direction to the shaft 44. After this adjustment has been made, the pin 52 may again be inserted so as to prevent further rotation of the shaft during the normal operation of the drums and torsion springs.

By having the outer extremity of the shaft 44 arranged in the manner described, adjustment of the springs 60 may be effected without the removal or displacement of any of the door parts. In other words, the free or outer extremity of the shaft 44 is accessible at all times because it projects laterally beyond the track and door panels and is conveniently accessible for manual manipulation or adjustment at all times. This constitutes a distinct advantage over certain conventional overhead door constructions referred to above, wherein adjustment of the spring tension can only be effected by shifting the door panels to their overhead position, and then either removing a panel or a glass of the panel in the vicinity of the drum and torsion spring so as to gain access to these parts.

It will be apparent from the foregoing description that my invention constitutes a distinct advancement in overhead door design. Not only does the present invention facilitate ease of operation of the door panels because of the novel arrangement of the bearing support for the door lifting drums, but also enables tension adjustment of the counterbalancing springs with the least possible effort and inconvenience. The non-rotating shaft, with its associated parts, presents a feature of construction which materially contributes toward the efficient functioning of the door panels as they are shifted between vertical door closing position and overhead open position.

By having the antifriction or ball bearing support for the lifting drums and the associated non-rotary shaft construction as described herein, the possibility of building up friction due to lateral distortion or bending of the shafts is reduced to a minimum. In other words, bending or lateral distortion of the shafts, even to the extent to which rotary spring supporting shafts have been subjected in certain conventional installations with which I am familiar, will not affect or disturb the smooth operating characteristics of the cable drums 62 and door panels 10—18.

While certain specific embodiments of the invention have been disclosed and described herein, it should be understood that the invention is by no means limited to these specific arrangements but contemplates other modifications and changes without departing from the spirit and scope of the appended claims.

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

1. Counterbalancing means for use in overhead door constructions of the type employing a plurality of hingedly connected panels for closing a door opening, and a track structure associated with each side of said panels, for guiding said panels between vertical door closing and open overhead position, said counterbalancing means including a flexible lifting element for the door panels, one end of which is adapted to be secured to the door panels, a shaft adapted to be mounted in a horizontal position above the doorway, said shaft being normally secured against rotation but adapted for occasional rotary adjustment, a drum rotatable on said shaft and having the other end of said flexible lifting element secured thereto whereby, when the panels are shifted downwardly, rotation will be imparted to said drum, a torsion type counterbalancing spring encircling said shaft, one extremity of said spring being fixed with the shaft and the other extremity being movable as a unit with said drum, and means associated with an extremity of said shaft including an interlocking pin and aperture arrangement whereby, when said pin is disengaged from the shaft, said shaft is adapted to be rotatably adjusted for adjusting the tension of said spring.

2. Counterbalancing means for use in overhead door constructions of the type employing a plurality of hingedly connected panels for closing a door opening, and a track structure associated with each side of said panels, for guiding said panels between vertical door closing and open overhead position, said counterbalancing means including a flexible lifting element for the door panels, one end of which is adapted to be secured to the door panels, a shaft adapted to be mounted in a horizontal position above the doorway, said shaft being normally secured against rotation but adapted for occasional rotary adjustment, a drum rotatable on said shaft and having the other end of said flexible lifting element secured thereto whereby, when the panels are shifted downwardly, rotation will be imparted to said drum, a torsion type counterbalancing spring encircling said shaft, one extremity of said spring being fixed with the shaft and the other extremity being movable as a unit with said drum, said shaft having a portion extending beyond said drum and located in the vicinity of one of the margins of said door panels when said panels occupy their open overhead position, and means associated with said extending portion of said shaft including an interlocking pin and aperture arrangement whereby, when said pin is disengaged from the shaft, said shaft is adapted to be rotatably adjusted for adjusting the tension of said spring.

3. Counterbalancing means for use in overhead door constructions, said counterbalancing means including a flexible lifting element, one end of which is adapted to be secured to the door, a shaft, means for permanently journaling the shaft above the doorway for rotation about a horizontal axis, a drum rotatably mounted on the shaft and adapted to receive the other end of said flexible lifting element, a torsion type counterbalancing spring encircling said shaft, one extremity of the spring being fixed to the shaft, and the other extremity being connected to the drum, interlocking pin means freely receivable within apertures in a fixed holding member and the shaft for releasably holding the shaft against rotation, and means on the shaft engageable for rotationally adjusting the shaft when the interlocking means is released.

4. A counterbalancing means as defined in claim 3 wherein said holding member includes a bracket and said freely receivable means includes a headed pin extending through the bracket and maintained in operative shaft holding position by its weight.

5. Counterbalancing means as defined in claim 3 wherein said holding member includes bracket portions above and below said shaft, both of said bracket portions being apertured to receive a holding member, said holding member including a pin and having a portion adapted to rest upon the upper bracket and a shank freely receivable in both apertures for holding the shaft on opposite sides thereof.

6. Counterbalancing means for use in overhead door constructions, said counterbalancing means including a flexible lifting element one end of which is adapted to be secured to the door, a shaft, means comprising spaced brackets for permanently journaling the shaft above the doorway for rotation about a horizontal axis, a drum rotatably mounted on the shaft and adapted to receive the other end of said flexible lifting element, a torsion type counterbalancing spring encircling said shaft, one extremity of the spring being connected to the drum, means fixedly attached to said shaft for receiving the other end of said spring, said last named end being fixed thereto, said shaft having a portion projecting axially beyond said fixedly attached means and journaled in one of said brackets, and means interengageable within said other bracket and the shaft for releasably holding the shaft against rotation and means on the shaft for receiving an adjusting tool adapted to rotationally adjust the shaft when the interlocking means is released.

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