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SPRING COUNTERBALANCE FOR VERTICALLY SLIDABLE DOORS

Filed Oct. 6, 1931

2 Sheets-Sheet 1

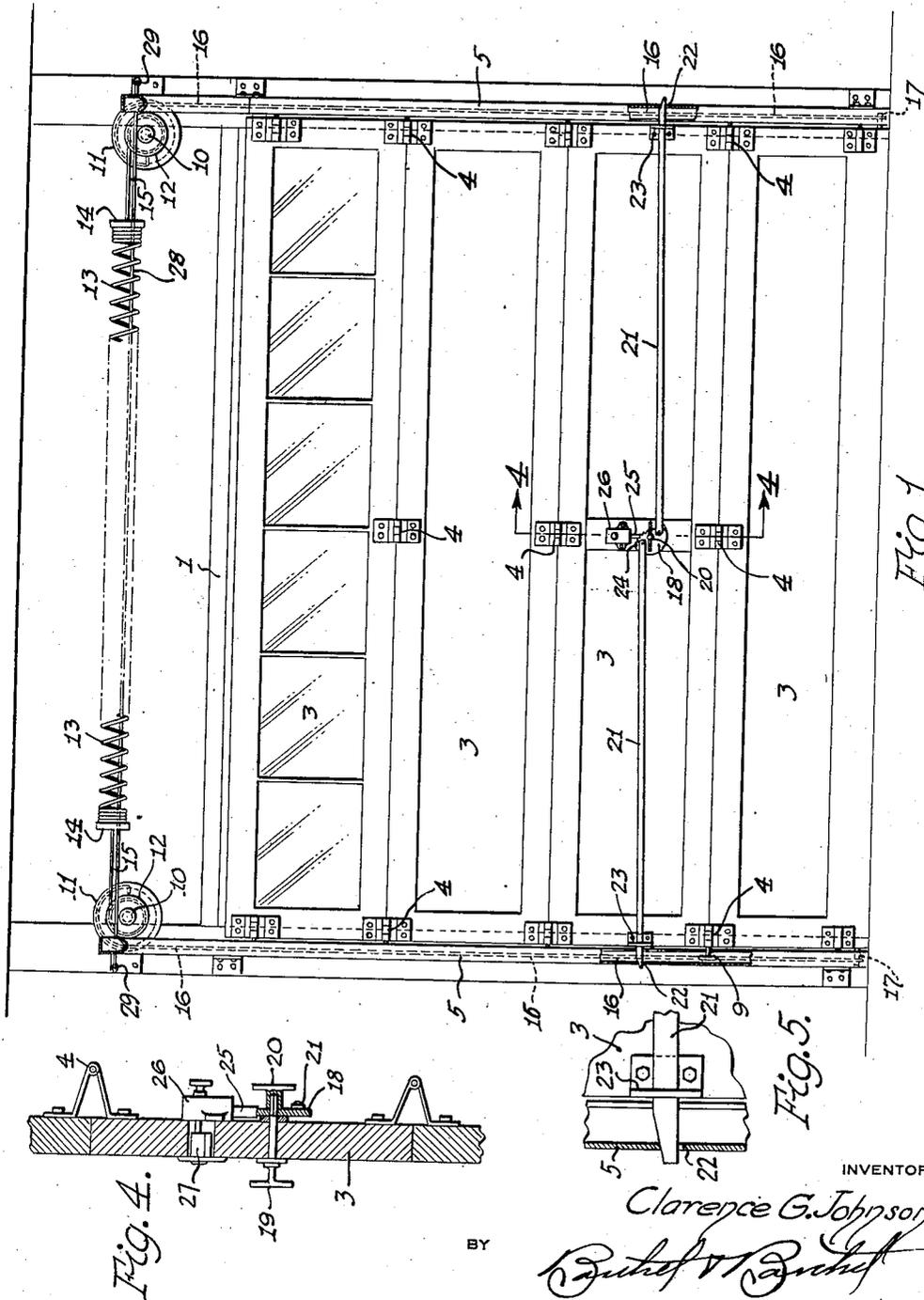


Fig. 1.

Fig. 5.

Fig. 4.

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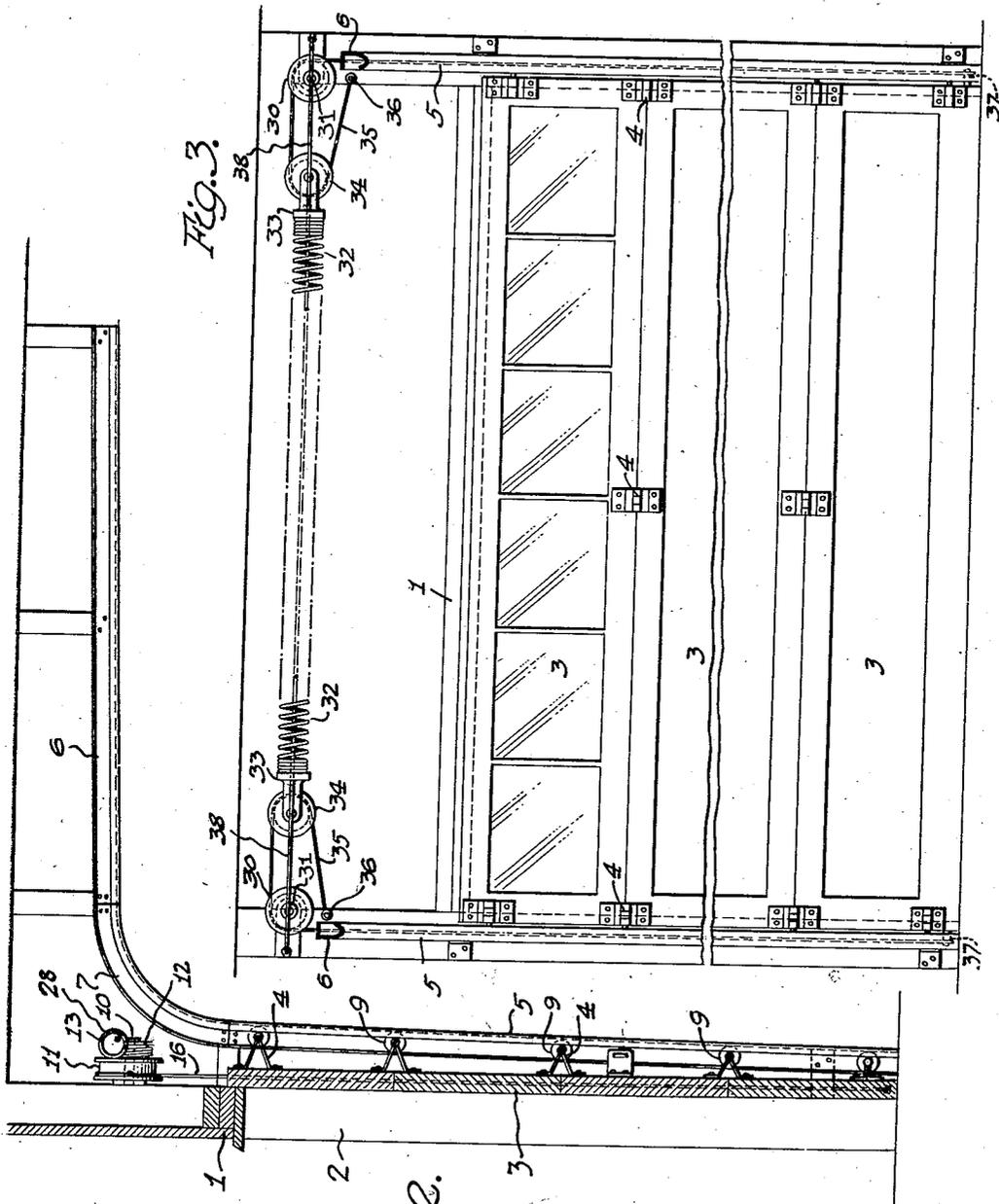


Fig. 3.

Fig. 2.

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SPRING COUNTERBALANCE FOR VERTICALLY SLIDABLE DOORS

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2 Claims. (Cl. 20—20)

The present invention pertains to a novel spring counterbalance for vertically slidable doors particularly of the type composed of superimposed panels hinged together and movable from a substantially vertical track onto an upper horizontal track.

In constructions of this character, the spring counterbalance has previously consisted of two springs, one for each edge of the door, extending from the door opening into the structure or otherwise disposed well inwardly of the structure. Such an arrangement, in addition to requiring duplicate spring systems, presents the further objection of taking up space in the already crowded interior.

These difficulties are overcome in the present invention by the use of a single spring lying preferably directly over the door opening and parallel to the upper edge of the door when in closed position. Cables extend from the ends of the spring over pulleys to the ends of the door with the result that the single spring has a counterbalancing action on both ends of the door. The pulleys may be of the simple or differential type and may be so arranged as to furnish any desired ratio between the length of door movement and the expansion or contraction of the spring.

The invention is fully disclosed by way of example in the following description and in the accompanying drawings, in which—

Figure 1 is an inside elevation of a door structure according to the invention;

Fig. 2 is a vertical transverse section thereof;

Fig. 3 is an inside elevation of a modified construction;

Fig. 4 is a section on the line 4—4 of Figure 1; and

Fig. 5 is a detail of the locking mechanism.

Reference to these views will now be made by use of like characters which are employed to designate corresponding parts throughout.

In Figures 1 and 2 is shown a door frame 1 forming a door opening 2 adapted to be closed by means of a vertically slidable door consisting of superimposed panels 3 hinged together as at 4. The door frame 1 supports a pair of rails at the ends of the door opening, each rail having a substantially vertical portion 5 inclined slightly inwardly of the opening, and a horizontal portion 6, with an arcuate portion 7 between the parts 5 and 6. Certain of the hinges 8 joining the panels at the ends thereof extend inwardly and carry rollers 9 which ride in the rails 7. The hinges 8 are of progressively increasing length upwardly

along the door to compensate for the inclination of the parts 5 of the rails.

The door is equipped with a counterbalancing system including a pair of double pulley blocks rotatably mounted on fixed pivot pins 10 over the door and preferably at the ends thereof. Each block consists of a larger pulley 11 and a smaller pulley 12 having preferably half the radius of the larger pulley. Between the pulley blocks is provided an elongated coil spring 13 with plugs 14 at its ends. The support for the spring consists of cables 15 extending from the plugs 14 and wound on and secured to the respective adjacent smaller pulleys 12. Another pair of cables 16 are wound on and secured to the larger pulleys 11 and secured to the adjacent edges of the door, preferably at the lower ends as indicated by the numeral 17.

The locking mechanism for the door comprises a disk 18 rotatably mounted in the vertical center and at the inner side thereof. The disk is operable from either side of the door by handles 19 and 20 as shown in Figure 4. Locking bars 21 have one end pivoted eccentrically to the disk 18 and the other end receivable in slots 22 in the rails 5, after passing through supporting guides 23 carried by one of the panels 3. The disk has teeth 24 engageable by the bolt 25 of a lock 26 on the inner surface of the door, whereby the rods 21 may be secured in locked position. The bolt 25 may, however, be released by means of a suitable key inserted in a cylinder 27 accessible at the outer surface of the door. When the door is raised, the length of cable 15 spent out by each of the smaller pulleys 12 is obviously half as great as the distance through which the door is raised. Inasmuch as the spring is active on two such cables, the contraction of the spring is equal linearly the distance through which the door is raised.

A rod or wire 28 is passed through the spring 13 and has its ends secured as at 29 to the sides of the door frame. In case the spring should break, the member 28 will prevent it from flying.

In the modification shown in Figure 3, simple pulleys 30 are pivotally mounted on fixed pivot studs 31 over the door and preferably at the ends of the door opening. In this case there is also provided a single spring 32 lying preferably parallel to the upper edge of the door and between the pulleys 30. The ends of the springs carry plugs or brackets 33 in which are journaled pulleys 34 preferably of equal radius to the pulleys 30. In this way there is provided a pair of pulleys at each end of the spring. A cable 35 is

trained over each such pair and has one end fixed as at 36 to the door frame structure 1 and the other end secured to the adjacent edge of the door, preferably at the lower end thereof as indicated by the numeral 37.

Due to the fact that each of the cables 35 is in two laps, each pulley 34 moves inwardly or outwardly a distance equal to half the distance through which the door is moved. Since the spring carries two pulleys 34, the expansion or contraction of the spring equals the distance through which the door is moved. A rod or wire 38 is also passed through the spring 32 as in Figure 1.

Although specific embodiments of the invention have been illustrated and described, it will be understood that various alterations in the details of construction may be made without departing from the scope of the invention, as indicated by the appended claims.

What I claim is:—

1. The combination with a door frame, of a vertically slidable door received in said frame, pulleys mounted on said frame above said door, a spring disposed between said pulleys, cables con-

necting opposite ends of said spring to the adjacent pulleys, cables connected to said pulleys and to said door at points adjacent to the lower edge thereof, and an elongated member passed through said spring and having its opposite ends anchored to said frame.

2. Counterbalance means for a door consisting of super-imposed hingedly connected panels having means thereon slidably received in rails mounted in a door frame and composed of vertical, arcuate and horizontal portions, said counterbalance means comprising double pulley blocks mounted in said frame above said door, each of said pulley blocks having portions of different diameters, a spring disposed between said blocks, a cable extending from each end of said spring and wound around the smaller diameter portions of said pulley blocks, and another cable wound around each of the larger portions of said pulley blocks and secured to said door adjacent to the lower part thereof, the diameter of the larger portions of said pulleys being substantially twice that of the smaller portions.

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