Nov. 29, 1955 D. M. ROBINSON 2,724,857

CONTROL ARM AND COUNTERBALANCE FOR OVERHEAD DOOR

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FIG. 1

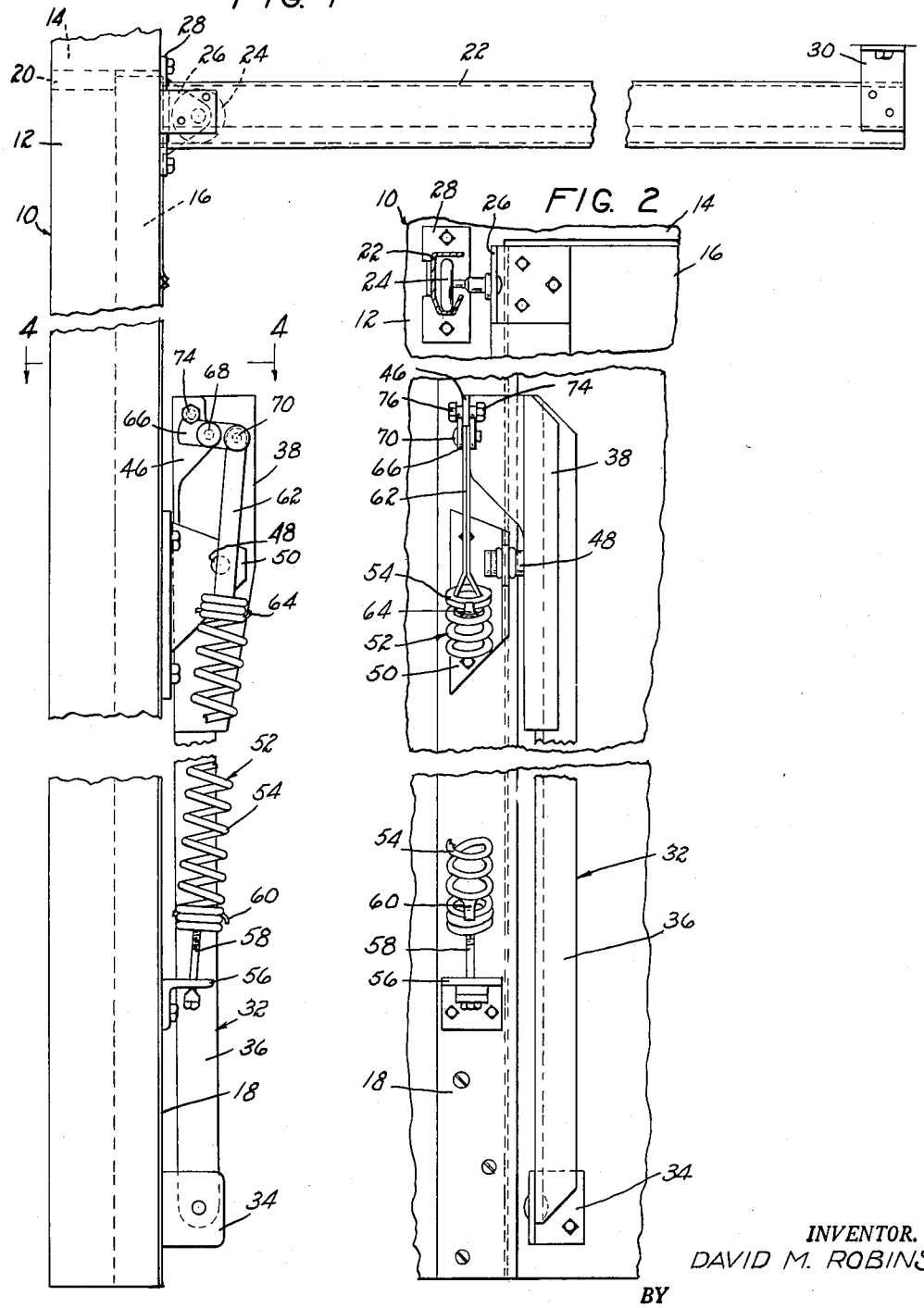


FIG. 2

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FIG. 3

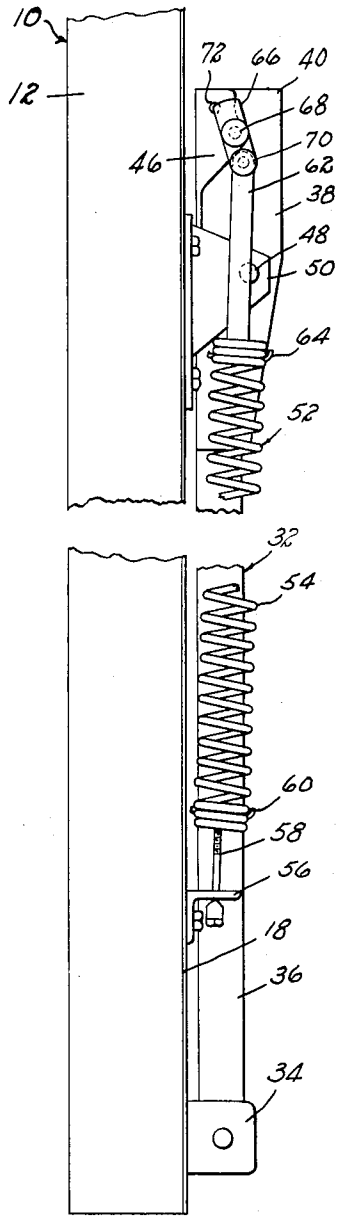


FIG. 4

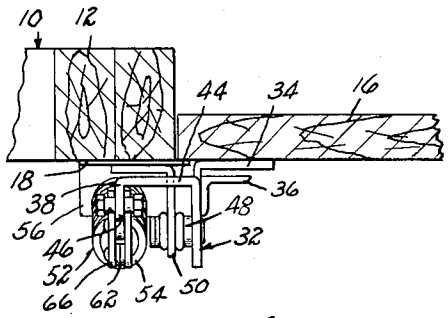
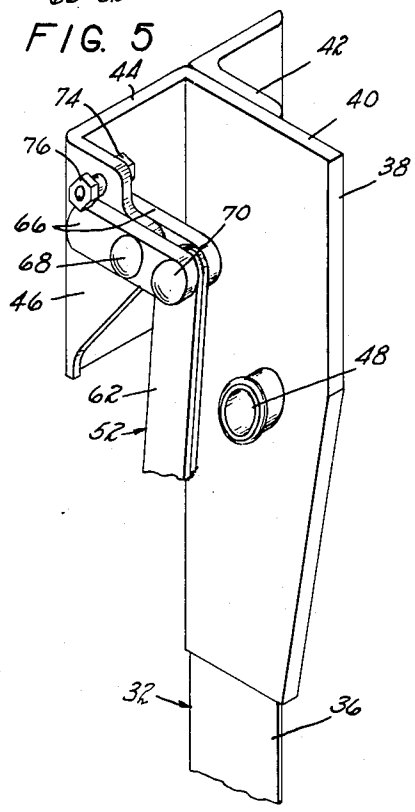


FIG. 5



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CONTROL ARM AND COUNTERBALANCE FOR OVERHEAD DOOR

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Application July 22, 1953, Serial No. 369,692

1 Claim. (Cl. 16—1)

The present invention relates to swing-up doors and pertains, more particularly, to a counterbalancing mechanism for swing-up doors of the unarticulated type which are adapted to swing upwardly from a closed vertical position in the doorway to an open horizontal position overhead.

In installations of doors of the type referred to, it is the usual practice to provide counterbalancing mechanism to facilitate opening and closing of the door. In some cases, the user prefers a counterbalance which will cause the door to open automatically whenever it is unlatched. In other cases, the user may prefer a counterbalance which will hold the door in closed position until it is manually started toward open position. It is therefore desirable to have a single counterbalancing mechanism which can meet either requirement and which can be adjusted for either type of operation in a simple and easy manner.

Accordingly it is an object of the invention to provide a counterbalance for doors of the type referred to which is of economical and efficient construction, which can be easily installed, which can be conditioned for either automatic or non-automatic operation and wherein the means for selecting the type of operation desired is simple and easy to manipulate and yet effective and foolproof in operation.

Other objects will be in part obvious, and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application of which will be indicated in the appended claim.

In the accompanying drawings:

Fig. 1 is a fragmentary side elevational view of an overhead door installation showing the counterbalancing mechanism of the present invention installed and adjusted for automatic operation;

Fig. 2 is an elevational view corresponding to Fig. 1, the view being taken in a direction looking at the rear of the door;

Fig. 3 is a view similar to Fig. 1 but with the counterbalancing mechanism adjusted for non-automatic operation of the door;

Fig. 4 is a sectional view taken in the direction of line 4—4 of Fig. 1; and

Fig. 5 is an enlarged perspective view of the adjusting means with the counterbalancing mechanism conditioned for automatic operation of the door.

Referring in detail to the drawings, there is depicted a doorway or frame bearing in general the reference numeral **10**, the door frame **10** comprising two spaced vertical side posts **12** and a bridging lintel or header **14** connecting together the upper ends of the two side posts. Within the door frame **10** is a door **16**, the rear face of which abuts against a pair of jamb strips **18** attached to the side posts **12** and a jamb strip **20** similarly fastened to the lintel **14**.

Extending rearwardly in a horizontal direction from the upper ends of the pair of side posts **12** is a pair of spaced horizontal tracks **22**, the cross-sectional figuration of which is best shown in Fig. 2. Within the confines of each track **22** is a roller **24** mounted for rotation on a trolley **26**, each trolley **26** being secured fast to the upper region of the door **16**. For the purpose of supporting the tracks **22**, there is employed an end bracket **28** connecting the forward end of the track to one of the upstanding posts **12** and adjacent the rear end of the track is a strap **30** affixed to a portion of an overhead beam constituting a part of the building structure itself.

Inasmuch as the upper end of the door **16** is pivotally supported by the pair of trolleys **26**, and the rollers **24** thereon may travel rearwardly along the tracks **22**, the lower end of the door may be swung outwardly and upwardly from its vertical closed position and into a horizontal open position overhead. Co-operating to produce the path traversed by the door in moving from a closed to open position is a pair of swinging arms designated generally by the reference numeral **32**, the lower ends of the arms being pivotally secured to the lower end of the door **16** by means of a pair of bearing brackets or ears **34** fastened in any suitable manner such as by bolts or screws, to the door itself. Each of the swinging arms **32** is formed of angle iron **36** and has secured thereto at its upper end a bracket **38** having a flange **40** welded to the flange **42** of the arm.

Forming an integral part of each bracket **38** is a web **44** which serves to carry a smaller flange **46** in a somewhat offset manner from its other flange **40**. The flange **40** is provided with an anti-friction bearing **48** so that the entire arm assemblage **32** may be pivotally mounted to a bracket **50** which is in turn made fast to each post **12**. In this way, the arm assembly **32** pivots about the fixed point **48** as the door is moved from a closed to open position.

Turning now to the counterbalancing mechanism generally indicated by the numeral **52**, it will be observed from the drawings that this mechanism includes a pair of coil springs **54** adjustably anchored at their lower ends by a bracket or ear **56** secured to each of the vertical posts **12**. A suggested means of adjusting the tension in the coil spring **54** may take the form of a rod or bolt **58** having a threaded end received in a plate member **60** engageable between any two adjacent convolutions near the lower end of the spring **54**. By so connecting the lower end of the spring, it will be recognized that the tension of the spring may be varied both by the particular convolutions selected for receiving therebetween the plate **60**, depending upon their proximity to the lower end, and also, since the rod **58** is threaded, the advancing or retracting thereof with respect to the plate **60** and consequently relative to the spring **54** itself. At the upper end of each spring **54** is disposed a reversely bent strap **62** looped about a plate **64** placed between adjacent convolutions at this end of the spring. Accordingly, the particular convolutions selected for receiving the plate **64** may likewise influence the degree of tension imposed upon the spring **54**.

In accordance with the invention each of the straps **62** is connected to the bracket **38** of the adjacent swinging arm **32** by means of a pair of links **66**, the links **66** embracing the flange **46** and being pivotally connected thereto intermediate their ends by a pivot pin **68**. The strap **62** is inserted between the outer ends of the links **66** and is pivotally connected thereto by a pivot pin **70**. The pivot pin **68** is located so that the center line between it and the bracket **56** when the door is closed falls to the left of bearing **48** as viewed in Figs. 1 and 3 and the links **66** are sufficiently long so that when they are held approximately in a horizontal position as by means of a bolt **74** as shown in Figs. 1 and 5 the center line between pivot

pin 70 and bracket 56 falls to the right of bearing 48. As a result of this construction all that it is necessary to do to condition the apparatus for automatic operation is to insert a bolt 74 through an aperture 72 provided for this purpose in each of flanges 46, each bolt being preferably retained in place with a retaining nut 76. In order to condition the apparatus for non-automatic operation, all that the user has to do is remove the bolt 74.

The operation probably will be apparent from the foregoing description together with the following explanation. During the opening movement of the door, of course, the upper end of the door is guided rearwardly by the tracks 22 while the lower end is swung arcuately upwardly by the pivoting of the arms 32 about the bearings 48. The door is counterbalanced by the tension of springs 54 acting on the free ends of the arms 32.

When the bolts 74 are inserted through the apertures 72 to hold the links 66 in the generally horizontal position depicted in Fig. 1, it will be recognized that the springs 54 produce an initial moment arm action about the pivot 68 to urge the lower end of the door outwardly. In this way, when the door is unlatched, the spring 54 will cause immediate movement of the swinging arms 32 about the pivot point 48, thus opening the door. However, when the bolts 74 are removed from the apertures 72, then the links 66 assume a somewhat vertical position as seen in Fig. 3. This resulting relationship of links 66 reverses the moment arm inasmuch as the springs 54 act in a direction on the opposite side of the pivot point 48 from that which they act in Fig. 1. Accordingly, in this latter situation, there is no tendency for the bottom of the door 16 to swing outwardly, and consequently in order for the door to be opened after unlatching it, a manual force must be first applied in order to move the lower end of the door outwardly. When the door has been moved manually far enough to bring the center line between pivot pin 68 and bracket 56 to the right of bearing 48, the springs 54 then become effective to raise the door into the horizontal position it assumes when the door is fully opened.

It will be apparent that when the door is fully opened, the arms 32 will have pivoted through an angle of approximately 180 degrees from the position shown in Figs. 1 and 3 and the end of the arms connected to the bracket 34 will then be uppermost. In this position, the links 66 will no longer engage the bolts 74 if such bolts are present

and will clear the apertures 72. Thus when the door is opened it is a simple matter to insert or remove the bolts 74 to obtain whatever type of action is desired. It thus will be seen that automatic or non-automatic operation is attained with a single simple mechanism and adjustment may be easily and quickly accomplished.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claim is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim:

A counterbalance for a door movable from a vertical position in a door frame when closed to an overhead horizontal position when open comprising a swingable arm, a first pivot adapted to be fixed to the door frame and connected to said arm intermediate the ends of the arm, means for pivotally securing one end of the arm to the door adjacent the lower edge of the door, a tension spring, means for anchoring one end of the spring adjacent the bottom of the door frame, a link pivotally connected at one end to the other end of the spring, a second pivot connecting the link to the free end of the swingable arm for movement between a first position wherein the line of force of said spring is on the opposite side of said first pivot from the door and a second position wherein the line of force of said spring is between the door and said first pivot when the door is closed, and a removable bolt secured to the free end of the swingable arm for engagement with the free end of the link to hold the link in said first position.

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