

Feb. 12, 1935.

H. G. KELLY

1,990,870

ROLLING DOOR MECHANISM

Filed March 26, 1931

3 Sheets-Sheet 1

Fig. 1.

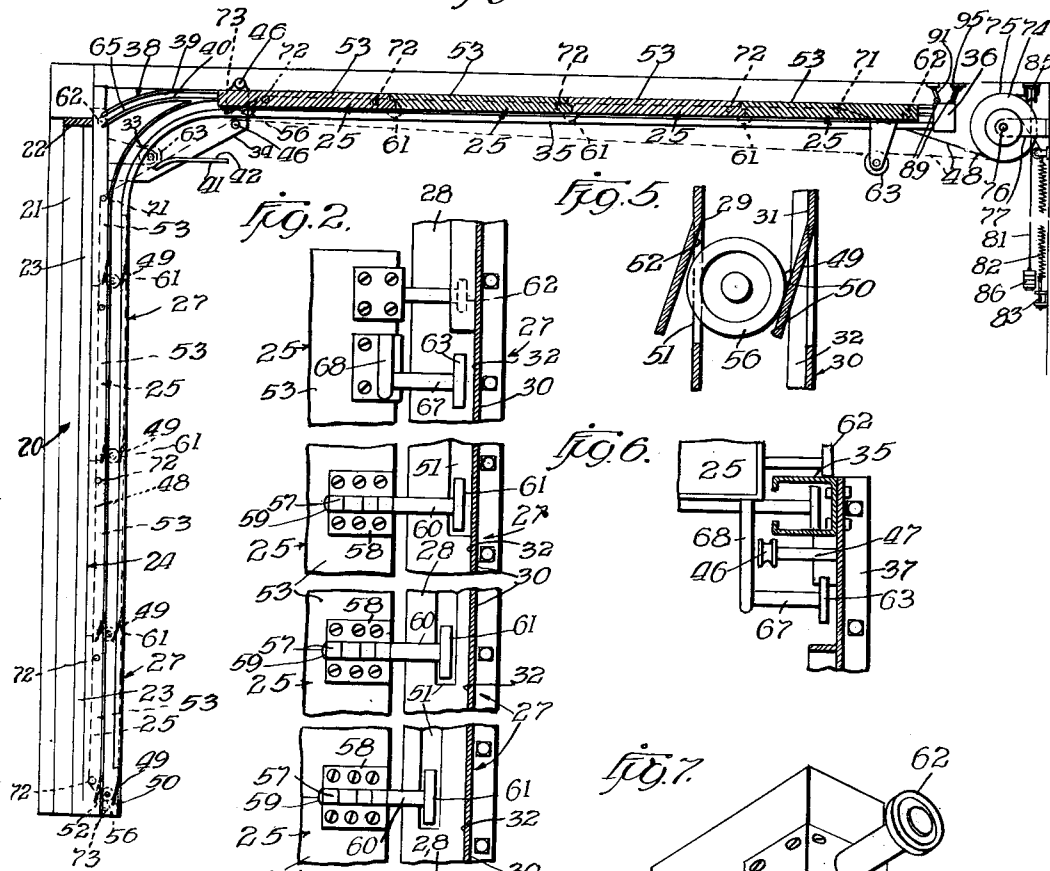


Fig. 2.

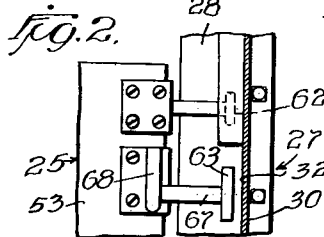


Fig. 5.

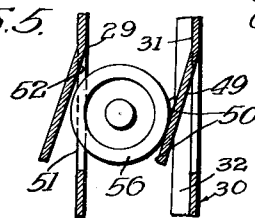


Fig. 6.

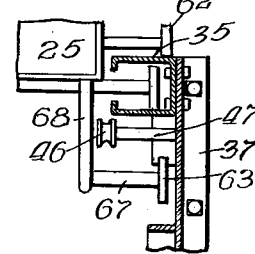


Fig. 7.

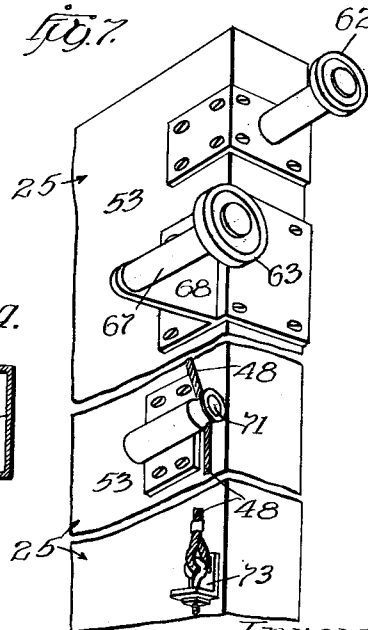


Fig. 3.

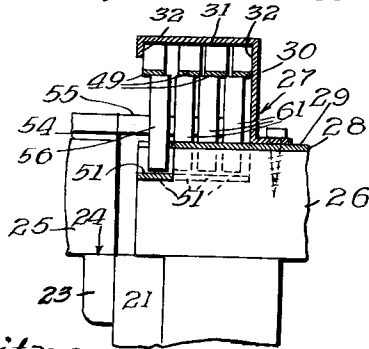
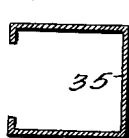


Fig. 4.



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ROLLING DOOR MECHANISM

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3 Sheets-Sheet 2

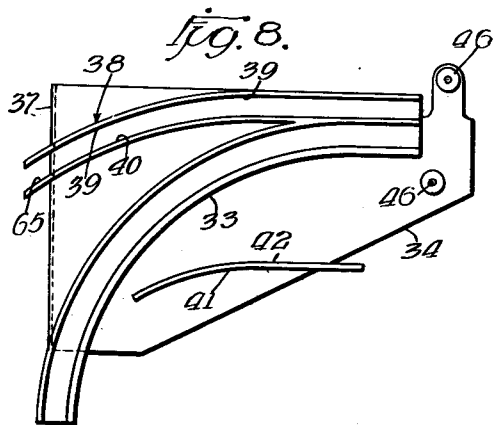
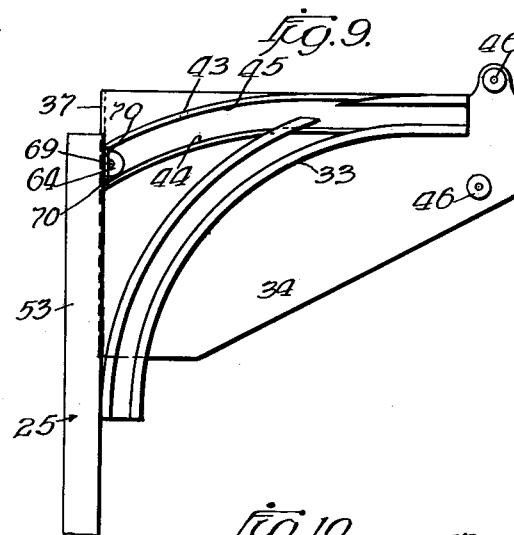
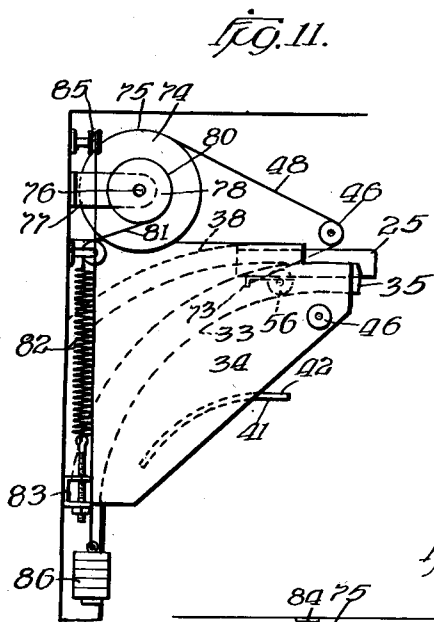
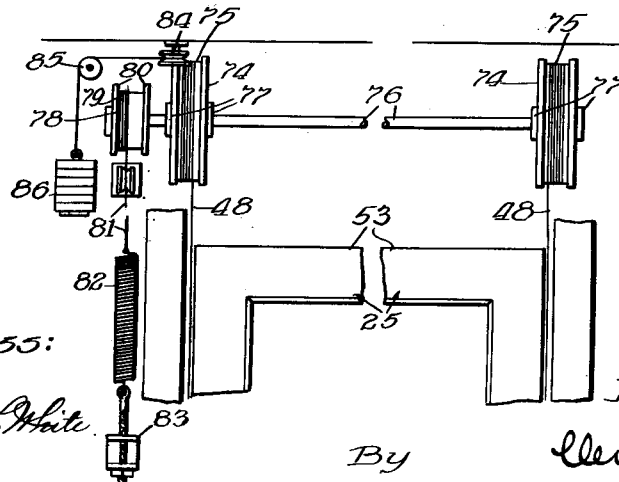


Fig. 11.



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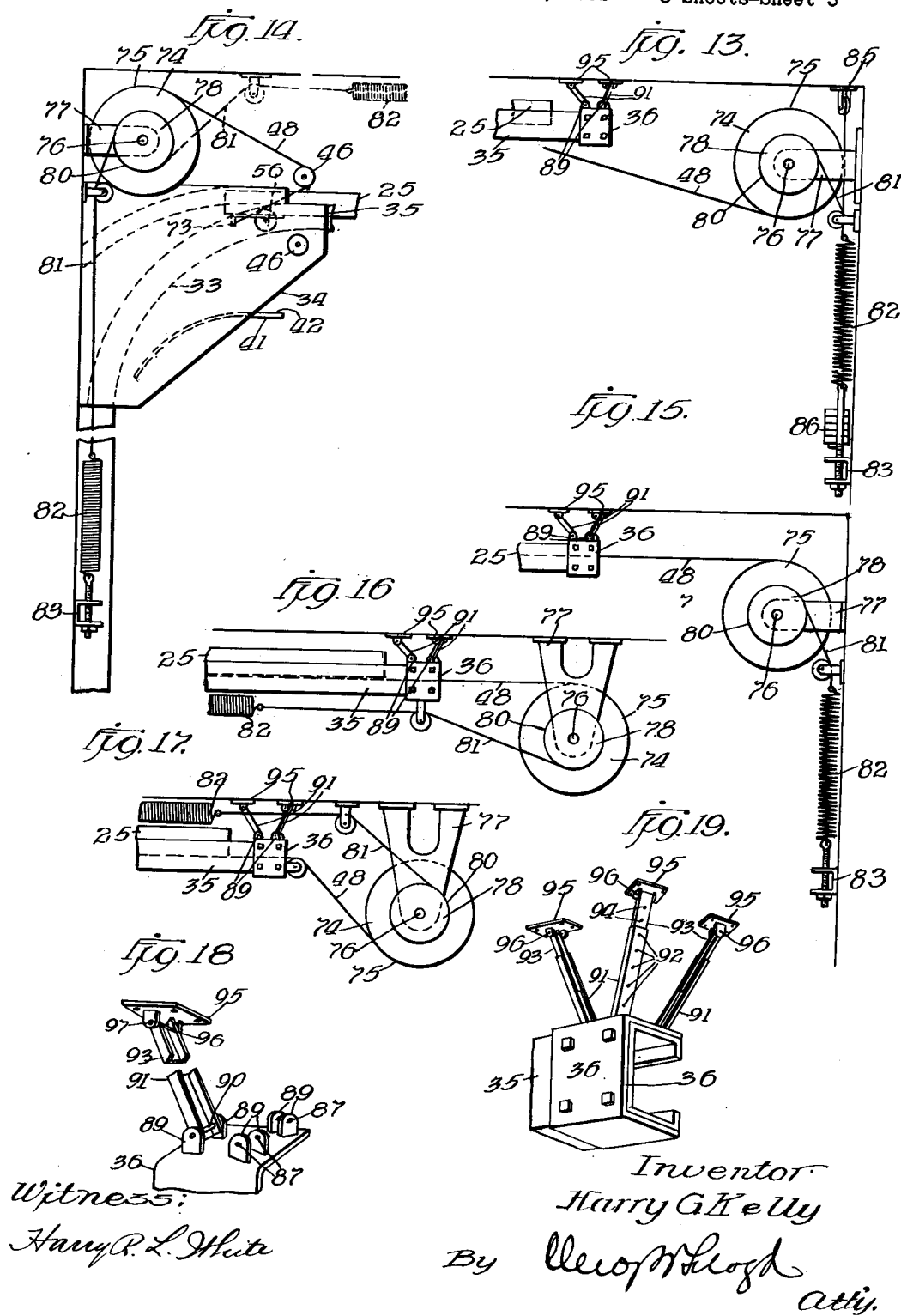
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ROLLING DOOR MECHANISM

Filed March 26, 1931

3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

1,990,870

ROLLING DOOR MECHANISM

Harry G. Kelly, Omaha, Nebr.

Application March 26, 1931, Serial No. 525,572

2 Claims. (Cl. 20—20)

The present invention relates to a door and hanging means therefor, and as employed in the present instance, it generally relates to a door adapted to be opened upwardly in a room with a low ceiling, closed downwardly, and moved laterally to be pressed tightly against the stops of a door frame as an incident to the closing of the door.

The objects of the present invention, among others, include the following:

An improved means for suspending an upwardly rolling door;

A novel means for moving a door laterally to the path of its normal movement to cause it to closely engage the stops of a door frame;

A novel track for a sectional door;

A unique arrangement of track, rollers, and deflectors to provide an improved door guiding and supporting device;

A unique means of balancing an upwardly rolling door so that the force required to open and close the door is reduced to a minimum;

A means of co-ordinating the closing motion of the upper panel of an upwardly and inwardly rolling sectional door with the motion of other sections of the door to assure a tight closure, a frictionless release of the door, and a level position when in horizontal open position;

A means for counter-balancing a door during the progress of the door from its vertical closed position to its horizontal open position and vice versa.

A new bracket securing a section of a horizontal track for a rolling door to a ceiling, such bracket being adjustable to ceilings of different heights from the plane of the track section.

These, and such other objects of the invention as may hereinafter appear, are obtained by the novel construction, unique arrangement, and improved combination of elements illustrated in the accompanying several sheets of drawings, disclosing several forms of the invention, and in which

Figure 1 is a cross section of a garage showing a door opening with the door here described in full lines in open position, and the door in dotted lines in its closed position. In said figure one of the two vertical sections of track used with the deflectors and recesses associated therewith is shown with a co-extending curved section of track, and two forms of supplemental track. There is also shown in said figure one of two horizontal track sections and one form of a door balancing means.

Figure 2 is a broken elevation showing the

assembly of the roller hinges and roller brackets in relation to a door and a vertical track section.

Figure 3 is a horizontal cross section of a wall with a mortised casing, the door track with its associated deflectors and opposed recesses, said figure showing the positions of the several rollers in respect to the track when the door is closed.

Figure 4 is a cross section of curved and horizontal sections of a co-extending track.

Figure 5 is a vertical longitudinal section of a vertical track showing the laterally deflected position of a roller when in contact with a deflector and partly received within an opposed recess at the point of closure of the door.

Figure 6 is a vertical cross section showing the relation of the upper rollers of a door with the upper tracks therefor, the open door being supported in a truly horizontal position by the contact of the uppermost roller with the upper exterior face of the track and by other rollers in contact with a lower interior track surface. This figure also shows the position of the two upper rollers in relation to supplemental tracks associated with the door brackets.

Figure 7 is a perspective view of an upper corner of a door showing two upper rollers adapted to be guided by supplemental tracks to assure tight closure of the upper panel of the door.

Figure 8 shows one of two opposed brackets and its association with the curved section of the main door track and two sections of supplemental tracks which contact with the rollers of the upper panel, and it also illustrates rollers adapted to guide cables at the time when the door is about to be closed.

Figure 9 shows a bracket with an associated curved section of the main track and another form of a supplemental track.

Figure 10 is a perspective view of the bracket, tracks and cable-guiding rollers shown in elevation in Figure 9.

Figure 11 is a cross section of the upper portion of a low-ceiling room with the upper portion of a main door track and the supplemental track shown in Figure 8. The door is in open position and one form of door balancing means is attached to the wall over the door opening.

Figure 12 is a partly broken away view of the upper portion of a wall, a door, and balancing means for the door attached to the wall over a door opening therein.

Figure 13 is an illustration of a balancing means attached to a wall opposite the door opening therein.

Figure 14 shows a simplified form of a door balancing means attached to the wall over a door opening, the door being shown in open position and two locations for the counter balancing spring being illustrated.

Figure 15 shows the simplified form of balancing means illustrated in Figure 14 attached to the wall opposite the door opening.

Figures 16 and 17 illustrate a simplified balancing means attached to a ceiling and two locations for the counter-balancing spring thereof which in Figure 16 is attached to a support bracket below the horizontal door track and which in Figure 17 is attached to the ceiling or the wall over a door opening.

Figures 18 and 19 show a bracket support for the free end of the horizontal track attached to a ceiling, such support being adjustable to ceilings of different heights from the track.

Like reference characters are used to designate similar parts in the drawings and in the description of the invention which follows.

The invention is adapted particularly for use in a garage or an industrial building having a relatively low ceiling. About a wide door opening 20 in a wall of such a building, there are vertical frame members 21 and a transverse frame member 22 extending between frame members 21 above the door opening 20.

Associated with frame members 21 and 22 are stops 23 having a face 24 perpendicular to the face of frame members 21 and 22, and capable of registry with the edge of the side of a door 25 closing opening 20.

A supporting member 26 is attached to the wall and to vertical frame member 21 on either side of opening 20 and extends above vertical frame members 21 if so desired. A vertical section of track 27 is secured to said supporting members. Said track consists of one member 28 adjacent to the supporting members and having a surface 29 parallel to the face of door 25, and a second track member 30 having a flat surface 31 opposed to surface 29 of track member 28. By making the track member 30 of an angular member, two opposed surfaces 32 formed of the wings perpendicular to track surface 31 are provided, as shown. Track member 30 is formed to permit of its engagement with surface 29 so that the track members may be secured to supporting member 26 in exact registry by lag screws or other suitable fastening means.

Track section 27 extends vertically in contact with vertical support member 26 until adjacent the upper portion of door opening 20 where track section meets a curved section 33 of the track having inner surfaces in continuation of inner surfaces of vertical track section 27.

A bracket 34 is attached to track 27 and to support member 26 and also to track section 33 and maintains the registry of the upper end of track section 27 and the lower end of track section 33. A track section 35 is attached to bracket 34 in horizontal continuation of the upper end of curved track section 33. The end of track section 35 furthest removed from door opening 20 is supported by an adjustable bracket 36 generally attached to the garage ceiling.

Bracket 34 has a flanged portion 37 for attachment to the supporting member 26, which may be either the wall or the ceiling. Said bracket 34 may carry, alone or conjointly, a curved track section 38 with opposed surfaces 39 and 40 perpendicular to the face of bracket 34, a track section 41 with an upper curved surface 42, and

a track section 43 with opposed surfaces 44 and 45. Bracket 34 may also carry one or more rollers 46 supported on brackets 47 to guide a cable 48 attached at one end to door 25.

Associated with track member 30 are several deflectors 49 in staggered vertical relationship with each other and having surfaces 50 inclined downward and away from the surface 31 of said track member 30. Each of the deflectors 49 encountered in movement upwardly from the lower end of track member 30 has one corresponding edge separated a successively greater distance from one lateral inner face 32 of track member 30. The corresponding edges referred to are either toward door opening 20 or away from said door opening in both track members 30.

Opposed to the deflectors 49 in track member 30 are recesses 51 disposed in track member 28, said recesses being in staggered vertical relationship with each other and having inclined surfaces 52 parallel to surfaces 50.

The door 25 adapted to close opening 20 comprises sections 53 hinged together and carries a plurality of rollers positioned on spindles extending laterally from the two vertical edges of said door. Near the bottom of the lowest section 53 of the door, there is a pair of brackets 54. Each of said brackets terminate in a spindle 55 upon which a roller 56 rotates.

At each end of sections 53 where said sections are joined together, there is a hinge member 57 having opposed wings 58 secured to opposed and adjacent sections 53. Said hinge members 57 include a pintle 59 terminating in a roller shaft 60 on which a roller 61 rotates.

In Figure 2, there is illustrated a roller 56 in each track positioned adjacent to the wing surface 32 nearest the door 25. Each of the rollers 61 encountered upwardly from roller 56 is separated a successively greater distance from the wing surface 32 just mentioned, the uppermost roller 61 being adjacent to the opposed wing surface 32.

When used in conjunction with the supplemental track section 43, illustrated in Figure 10, rollers 56 are adjacent the wing surface 32 farthest from door 25 and the rollers 61 are separated a different distance from said wing surface, the uppermost roller 61 being adjacent to the wing surface 32 nearest the door 25.

Each of the deflectors 49, as will be noted from Figures 2 and 3, is so positioned that only when door 25 is about to be closed do the several rollers 56 and 61 register with the deflectors 49 provided therefor. As the door 25 is raised, roller 56 disengages its associated deflector 49 and simultaneously all rollers 61 disengage their associated deflectors 49.

In the further upward movement of the door 25, the deflectors 49 do not interfere with the free movement of the door 25 for the rollers 56 and 61 cannot contact with any of the deflectors 49 except the particular one provided for the engagement of each when the closing movement of the door is about to be completed.

The diameter of rollers 56 and 61 being but slightly less than the distance separating track surfaces 29 and 31, the lateral displacement of rollers 56 and 61 by contact with deflectors 49 is made possible by the reception of said rollers partly within recesses 51 in track member 28. As said recesses 51 are in staggered relation, as shown in Figures 2 and 3, no roller can be received in a recess except in the recess provided

for each roller at the completion of the closing movement of door 25.

By means of this simultaneous co-operation between all of the deflectors 49, recesses 51, and rollers 56 and 61 a lateral movement is imparted to door 25 outwardly against stops 23 at the completion of its downward closing movement.

As door 25 is raised, each roller 56 and 61 becomes disengaged from its associated deflector 49. The pressure of door 25 against the stops 23 of frame members 21 is thereby removed to permit the raising of door 25 in a movement free from frictional contact with said stops 23. As said upward movement of door 25 continues, each roller 56 and 61 contacts with inclined surface 52 of recess 51 into which said roller has been previously received, thereby forcing said roller into the portion of track section 27 bounded by opposed track surfaces 29 and 31. Thus, throughout the upward movement of the door, the path of said door 25 is maintained at a uniform distance from stops 23 on frame members 21.

To understand the manner in which the tight closure of the upper portion of the uppermost section 53 of door 25 against stops 23 of frame members 21 and 22 is obtained reference should be had to Figures 1, 8, 9 and 10 which show one of a pair of support brackets 34 carrying alternate forms of supplemental tracks 38, 41 and 43, guiding rollers 62, 63 and 64 carried by the uppermost section 53 of door 25. It will be noted that tracks 38, 41 and 43 provide a path entirely independent of the path provided for rollers 56 and 61 by curved track section 33.

Figures 1 and 8 illustrate a track section 38 associated with bracket 34 for guiding a roller 62 extending laterally from the edge of door 25 as shown in Figure 7. Track section 38 provides opposed track surfaces 39 and 40. Track surface 40 is a continuation of the uppermost outer surface of track section 35 and terminates adjacent the uppermost door section 53 in a curve 65 inclined to the face 24 of stops 23, whereby roller 62, contacting with said curved section 65 of track surface 40, guides the uppermost portion of said door section tightly against stops 23 of frame members 21 and 22 at the moment of the completion of the closing motion of door 25.

With the opening movement of door 25, the contact of the uppermost door section 53 with stops 23 is immediately released, and roller 62 rides along track surface 40 and subsequently along the uppermost outer surface of track section 35.

When a counterbalancing force is applied horizontally to the door 25, the upper flange section of track 38 providing track surface 39 may be eliminated, thus leaving the lower flange forming track surface 40 to act as a deflector.

Figure 6 illustrates, in elevation, the relation of the position of roller 62 secured by a bracket to the edge of door 25 to the position of rollers 56 and 61 secured to the face of a door 25 whereby when the door 25 is in its open horizontal position, all door sections are supported by rollers 56, 61 and 62 in a straight plane with no section forced out of alignment from such plane.

Figures 1 and 8 illustrate a track 41 with an upper curved surface 42 partly concentric with surface 40 of track 38. Contacting with surface 42 of track 41 is a roller 63 mounted on a spindle 67 extending laterally from a bracket 68 secured to the uppermost door section 53, said bracket extending perpendicularly from the face of door 25 to permit said roller 63 to clear track 33. The

lower portion of surface 42 of track member 41 is convergent toward the plane of face 24 of stops 23 whereby the contact of roller 63 with said lower portion of surface 42 forces the uppermost door section 53 tightly against stops 23 of frame members 21 and 22 at the moment when the closing movement of door 25 is completed. The progress of roller 63 along track surface 42 as the door is opened, releases top door section 53 immediately from contact with said stops 23, and as the opening movement continues, guides said door into a horizontal position with roller 62 riding upon the uppermost outer surface of track 35. Such guiding direction takes place with or without the cooperation of track 38, as desired.

Figures 9 and 10 illustrate still another track section 43 secured to a bracket 34 and possessing inner opposed surfaces 44 and 45, said opposed surfaces being continuations of a narrow portion of the vertically opposed inner surfaces of track 35. Co-operating with track 43 and horizontal track section 35 is a roller 64 rotating on a spindle 69 carried by a bracket 70 secured to the face of the uppermost door section 53.

When track 43 is used, spindle 55 of bracket 54 is lengthened, positioning roller 56 adjacent the inner surface 32 of track section 27 away from door 25.

Rollers 61 encountered upwardly are mounted on spindles 60 successively shorter so as to position rollers 56 and 61 in staggered relation, the uppermost roller 61 being adjacent surface 32 nearest door 25. Deflectors 49 and recesses 51 are positioned in track members 30 and 28 respectively to co-operate with rollers 56 and 61 as described before.

It will be seen that track surface 44 converges toward the plane of stop surfaces 24 whereby contact with roller 64 presses uppermost door section 53 tightly against stops 23 of frame members 21 and 22 when the door 25 is closed, all pressure being released immediately the said door 25 is raised upwardly for opening. As the opening motion is continued, roller 64 is guided along track section 43 and into track section 35.

When door 25 is closed, roller 64 is positioned directly above roller 56 so that roller 56, traveling upwardly as the door is opened, will contact with the under surface of track 43 stopping the opening movement of the door at this point. Track 35 being positioned above door opening 20, this stoppage does not prevent the vertical clearance of door opening 20 by door 25.

In this instance all rollers 56, 61 and 64 are positioned in exactly the same perpendicular relationship to the face of all door sections 53, whereby said door sections are supported without upward distortion of any section when door 25 is in its open horizontal position.

In Figure 7 there is shown a cable-guiding member 71 attached to uppermost door section 53 and controlling the position of a cable 48 when the door 25 is closed. There are other cable-guiding members 72 secured adjacent to the junctures of door sections 53 and an adjustable fastening means 73 to secure cable 48 to the lowest door section 53.

Cable 48, leading from a counter-balancing means, is carried over a guide roller 46 secured by a bracket 47 to bracket 34, and thence, contacting with cable-guiding members 71 and 72 to fastening means 73. Bracket 46 is positioned on bracket 34 and cable-guiding member 71 is positioned on uppermost door section 53 so that

the angle of cable 48 to said door section will provide for the application of the counterbalancing force with the least friction as said door section is guided in its initial opening movement by the co-operation of track sections 38, 41 or 43, said force being transferred to other door sections 53 as guide members 71 and 72 successively pass by guide roller 46 in the continuance of the opening movement of door 25. By carrying cable 48 outwardly of roller shafts 60, said shafts may act as cable guides in place of cable guides 72 if so desired.

An unique means for counterbalancing the variable effective weight of a door 25 throughout its movement from a vertical closed position to a horizontal, open position, is shown in various forms in Figures 1, 11, 12, 13, 14 and 15.

In all of the forms shown, such counterbalancing means includes a cable drum 74 opposed to each lateral edge of door 25, said drum 74 having around its circumference a cable receiving surface 75, around which cable 48 may be wound, said drum 74 being fixedly attached to a shaft 76 rotatable in the journals of brackets 77 secured to a wall or ceiling.

Said shaft 76 may continue from one drum 74 to the other of said drums 74 to equalize the application of counterbalancing force to both sides of the door 25.

On said shaft 76 there is also fixed a cable drum 78 with a circumferential surface 79 flanked by flanges 80, said surface 79 carrying a cable 81 having one end fixed to said drum 78 and the other end attached to the end of a coil spring 82. The other end of said spring is attached to a wall, ceiling or floor of the room structure, there being a turnbuckle or other means of adjustment 83 therebetween.

In Figures 1, 11, 12 and 13, cable 48, extending from its point of attachment to a door 25 over guide roller 46, is wound around surface 75 of drum 74 in complete frictional contact, and thence around horizontal pulley 84 and vertical pulley 85, to a weight 86, said weight counterbalancing the effective weight of door 25 in its vertical position.

The effective weight of door 25, however, is decreased steadily as more and more of the effective weight of said door is supported by rollers resting on track 35. It is obvious that the counterweighing force may be relatively decreased by the action of a selected compensating force as the door is opened.

To provide such force, cable 81 is attached to cable-drum 78 so that, as the door 25 is being opened and shaft 76 is being rotated by the action of counterweight 86 on drum 74, cable 81 winds on drum 78 stretching coil spring 82 until, during the door movement and in the fully open position of door 25, the decreased effective weight of said door is counterbalanced by the pull of the extended spring 82 retarding the force exerted by weight 86 on door 25.

In Figures 1, 11, 12, 13, 14 and 15, the diameter of cable drum 78 is shown as less than the diameter of cable drum 74 in order that the distance of extension of spring 82 relative to the distance of travel of the door may be reduced, an important requirement in most installations.

Moreover, as the pull of an extended coil spring varies with the distance of spring extension, so doors of different weights and their associated counterweights may be counterbalanced by varying the distance of extension of the spring by merely changing the diameter of cable drum 78.

In Figures 14, 15, 16 and 17, a simplified counterbalancing means is shown. In such form the cable drums 74 and 78 are fixedly mounted on a shaft 76 as previously described. In this instance, cable 48 is secured to drum 74, so that as door 25 is being opened, cable 48 may be wound on surface 75 of drum 74 in cooperation with the simultaneous unwinding of cable 81 secured to drum 78 whereby the force exerted by extended spring 82, fully counterbalancing the effective weight of door 25 in its vertical closed position, is gradually reduced as the extension of spring 82 and the effective weight of said door progressing to its horizontal open position, are both correspondingly reduced.

In Figures 1, 13 and 15, the brackets 77 of the balancing means are shown attached to a wall opposite the door opening 20, it being obvious that said brackets 77 may be turned upward to be secured to the ceiling or to another bracket extending downward from the ceiling, as shown in Figures 16 and 17.

In Figures 11, 12 and 14, said brackets 77 of the balancing means are shown attached to the wall above a door opening 20. Said brackets, however, may be turned upwardly to be secured to the ceiling.

The location of spring 82 is parallel to the wall, as shown in Figures 11, 12, 13, 14 and 15. Such location can be changed to a position parallel to the ceiling as shown in Figures 14 and 17 or attached to bracket 34 or to the wall so as to be suspended beneath the underside of track 35 and parallel with it.

In Figures 1, 15, 17, 18 and 19 is illustrated a bracket 36 securing the free end of track 35 to the ceiling. Bolted to track 35 is a bracket member 86 here illustrated as having three pairs of lugs 89 extending from its upper face. Each pair of lugs has opposed holes 87 to receive a pintle 90 for hingedly securing the end of a channel shaped shaft 91 bored at intervals along its length with holes 92.

Another shaft 93 of lesser size, capable of sliding contact with a shaft 91, and having similar holes 94, terminates in a hinged connection with a bracket member 95, capable of being secured to a ceiling.

Shafts 91 and 93 are bolted together through selected holes 92 and 94 to provide the approximate length required, and each connected shaft is brought to the ceiling where bracket member 95 is secured to the ceiling by means of screws or otherwise.

The angle of the joined shafts 91 and 93 to the ceiling being variable as well as the length of said joined shafts, said bracket 36 is adjustable to a wide range of heights of the ceiling from track 35.

Bracket member 95, being secured in hinged connection with shaft 93 by means of pintle 96 passing through holes 97 in shaft 93, it is obvious that similar holes 97 in shaft 91 may be used to receive pintle 96 of bracket member 95, thereby eliminating shaft 93 when adjustable bracket 36 is used in connection with low ceilings as shown in Figures 15 and 16.

I claim:

1. A supporting means for a door which in closed position occupies a vertical plane and in open position a horizontal plane, comprising a track, a bracket secured to said track and having arms hingedly connected thereto, and fastening plates for said arms hingedly attached thereto whereby angular position of said bracket 75

arm determines the relative position of said track and a horizontal supporting surface therefor.

2. An adjustable track supporting member intended to maintain a horizontal track in a selected position, comprising a track holding member, a plurality of U-shape arms hingedly connected thereto, the body of said arms having a plurality of apertures therein, and a second set of arms adapted to telescope in the first group of arms and having complemental apertures therein, and means engaging said apertures for maintaining

said groups of arms in a select position of extension, each of said second group of arms having an attaching plate hingedly associated therewith, the telescopic relation of said two groups of arms and the angular position thereof to the track holding member and attaching plates determining the position of said track supporting member and the track supported thereby relative to a horizontal supporting wall. 5

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