Nov. 14, 1944. O. J. WORKMAN 2,362,789

DOOR

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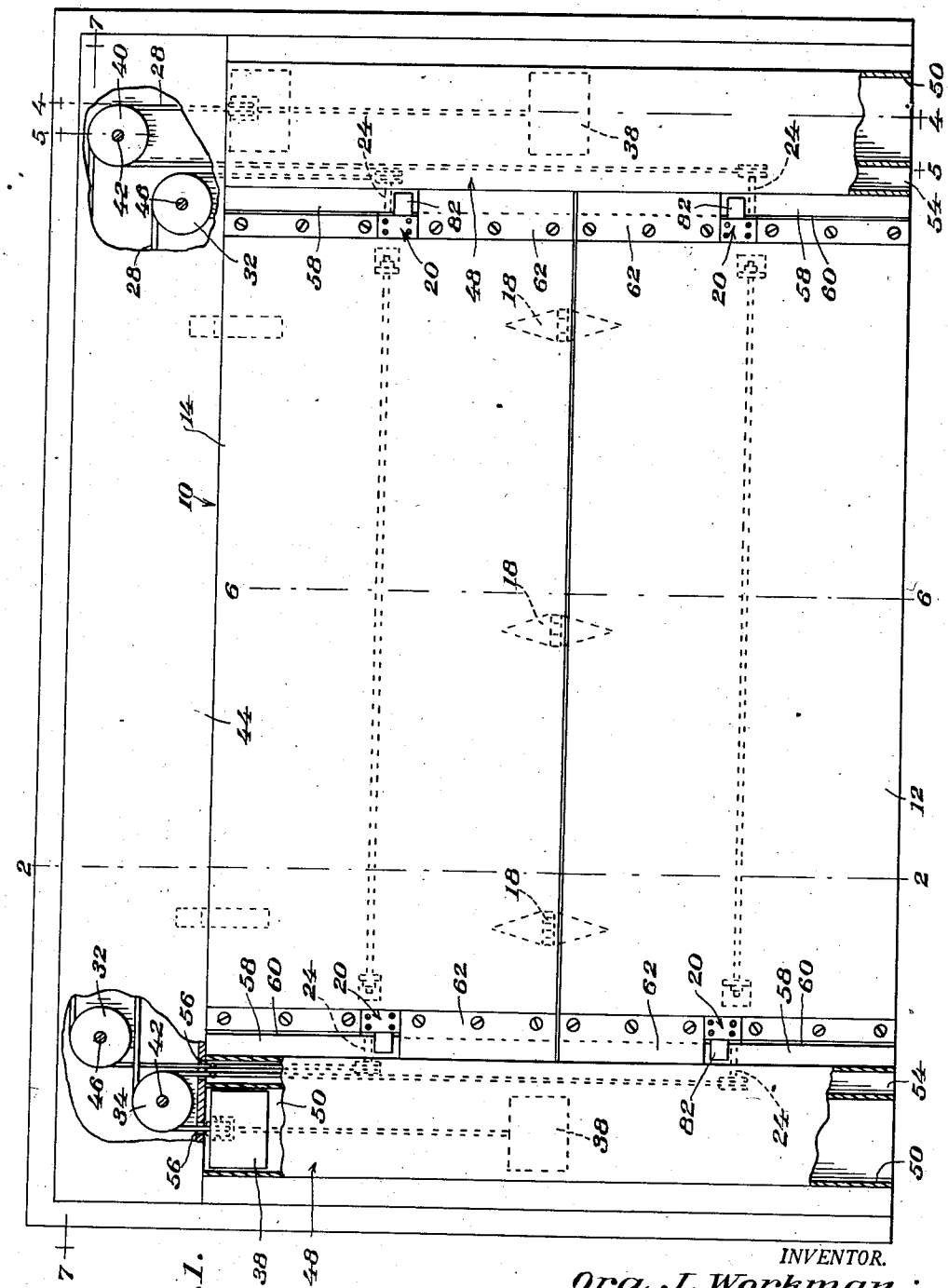


Fig. 1.

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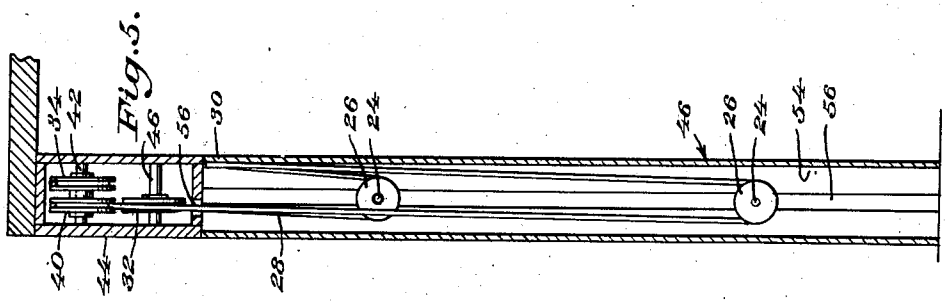


Fig. 5.

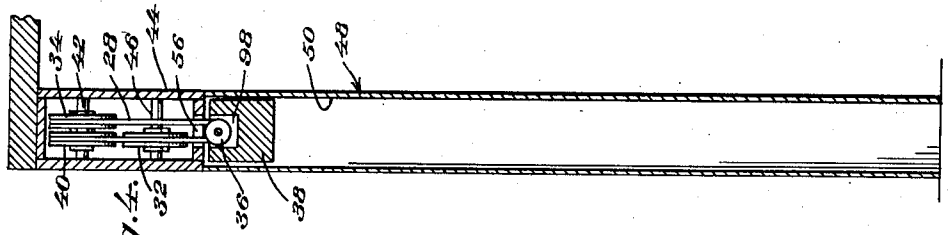


Fig. 4.

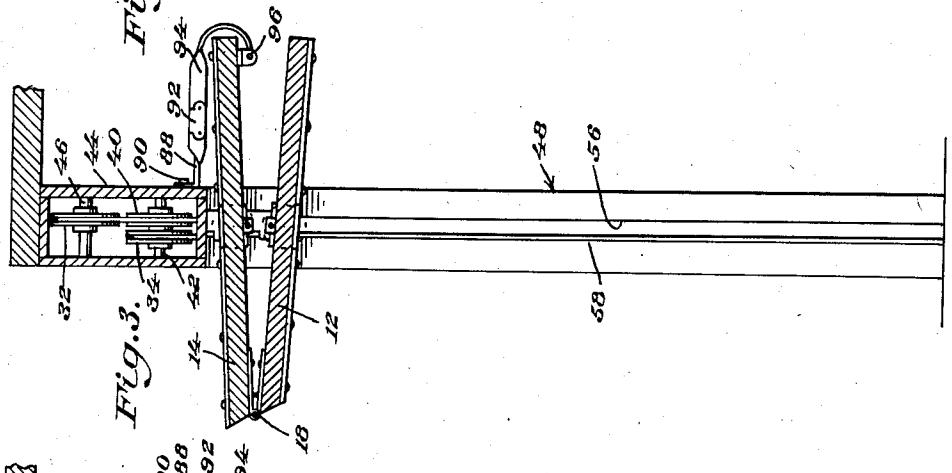


Fig. 3.

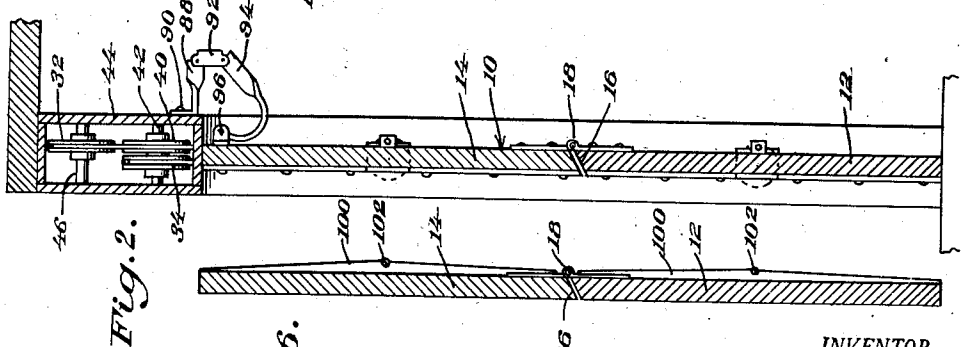


Fig. 2.

Fig. 6.

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DOOR

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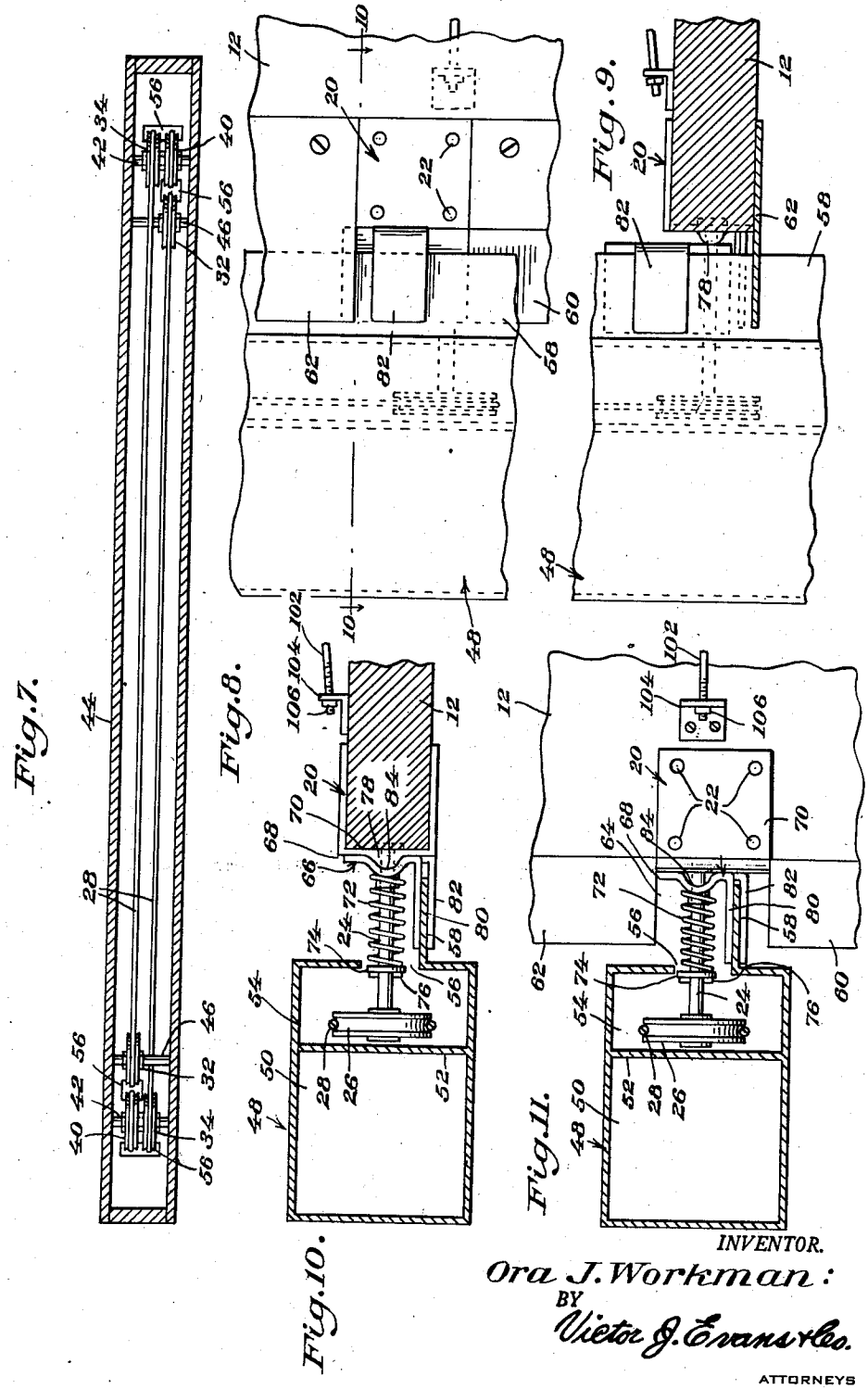


Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

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DOOR

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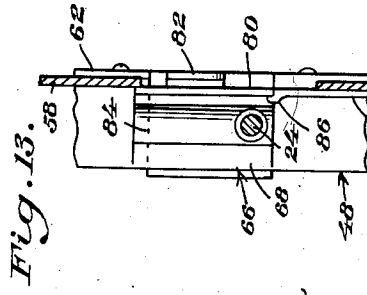


Fig. 13.

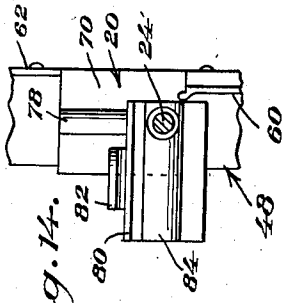


Fig. 14.

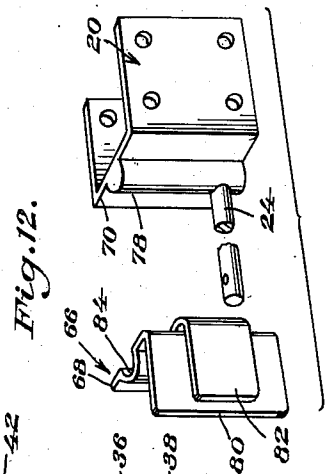


Fig. 12.

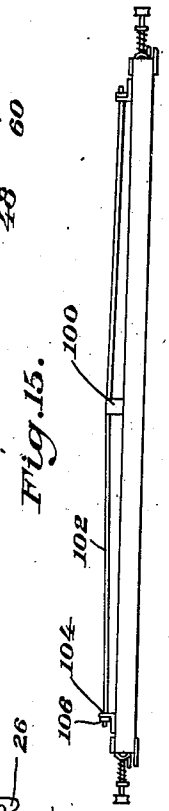


Fig. 15.

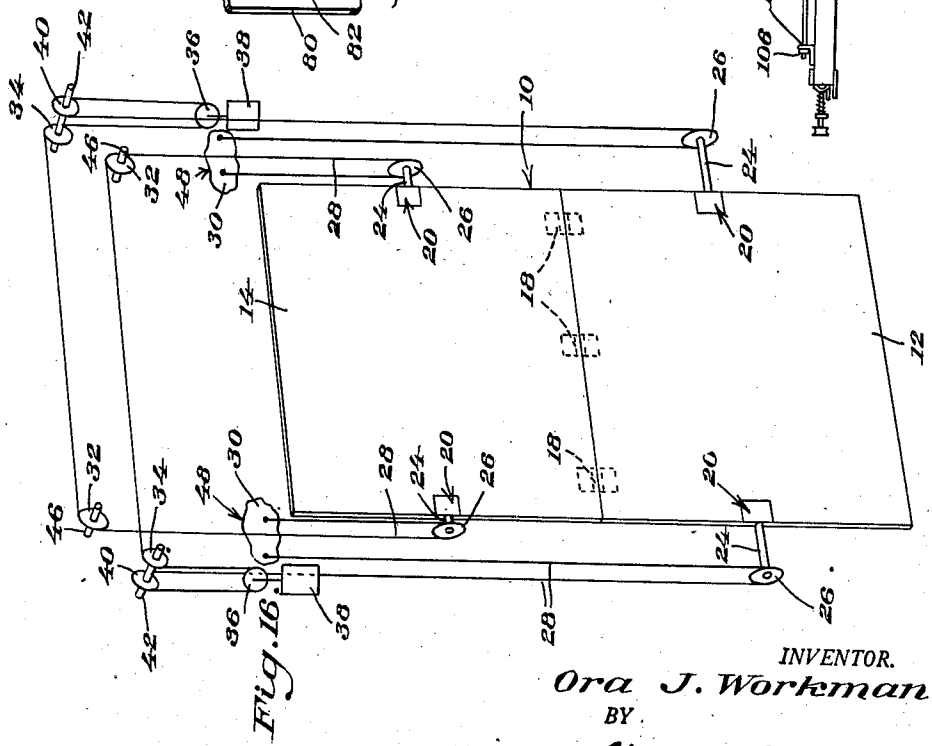


Fig. 16.

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Patented Nov. 14, 1944 2,362,789

UNITED STATES PATENT OFFICE

2,362,789

DOOR

Ora J. Workman, Anaconda, Mont.

Application September 7, 1943, Serial No. 501,465

10 Claims. (Cl. 160—190)

My invention relates to closures, more particularly doors of the overhead type, and has among its objects and advantages the provision of an improved sectional door designed to fold easily to an overhead and open position, wherein the door is counterbalanced in such manner as to be movable to open or closed positions with little effort, and in which novel weather sealing means are provided.

In the accompanying drawings:

Figure 1 is a face view, partly in section, of a door in accordance with my invention taken from a position exteriorly of the building.

Figure 2 is a sectional view taken along the line 2—2 of Figure 1.

Figure 3 is a view similar to Figure 2, but illustrating the door in its open position in contradistinction to its closed position of Figure 2.

Figure 4 is a sectional view along the line 4—4 of Figure 1.

Figure 5 is a sectional view along the line 5—5 of Figure 1.

Figure 6 is a sectional view taken along the line 6—6 of Figure 1.

Figure 7 is a sectional view taken along the line 7—7 of Figure 1.

Figure 8 is a detail view illustrating a weather sealing construction as it appears in the closed position of the door.

Figure 9 is a view similar to Figure 10 but illustrating the door in its open position.

Figure 10 is a sectional view along the line 10—10 of Figure 8.

Figure 11 is a view similar to Figure 10 but illustrating the door in an open position in contradistinction to the closed position of Figure 10.

Figure 12 is a perspective view of a door latch, with the parts separated.

Figure 13 is a view of a portion of the door latch.

Figure 14 is a view similar to Figure 13 but illustrating the door latch when the door is opened.

Figure 15 is a top edge view of the door, and Figure 16 is a perspective view of the counterbalancing structure.

In the embodiment of the invention selected for illustration, I make use of a door 10 comprising a bottom section 12 and a top section 14. In the closed position of the door 10, the sections 12 and 14 are arranged in a common vertical plane, as illustrated in Figure 2. The sections 12 and 14 have angular meeting edges 16, and the two sections are hingedly connected together at 18 for relative pivotal movement about a horizontal axis, as when the door is moved to its opened or closed position.

The two sections 12 and 14 are of the same horizontal length, and the two sections are of substantially the same vertical dimensions. Two channel brackets 20 are attached to the vertical edge margins of each section 12 and 14. These brackets may be secured to their respective door sections by bolts or rivets 22. To each bracket 20 is fixedly secured a horizontal shaft 24, best illustrated in Figures 10, 11 and 16. The shafts 24 associated with the section 12 are coaxial and located on the medial and horizontal line of that section, which is also true of the shafts 24 with respect to the section 14. Both sections are operatively connected with the counterbalancing structure of Figure 16.

In Figure 16, grooved pulleys 26 are rotatably mounted on the respective shafts 24. Two lines 28 are attached to a support 30 and pass downwardly about the pulleys 26 associated with the section 14. The lines 28 then pass upwardly about grooved pulleys 32 and then extend horizontally in opposite directions for passage about grooved pulleys 34. The lines then extend downwardly and pass around grooved pulleys 36 connected with weights 38 at opposite sides of the door. The lines then extend upwardly about grooved pulleys 40 and downwardly about the grooved pulleys 26 attached to the shafts 24 on the section 12. The lines then pass upwardly and are fixed to the support 30.

In Figures 2 through 5 and 7, the two sets of pulleys 34 and 40 are rotatably mounted on shafts 42 arranged horizontally in a box 44 constituting the overhead frame structure for the door 10. The pulleys 32 are mounted on shafts 46, the latter being also arranged horizontally in the box 44. The horizontal runs of the cables 28 between the two sets of pulleys 32 and 34 are housed in the box 44.

The box 44 is fixed to vertical boxes 48 constituting the vertical runs of the door frame structure. The weights 38 are slidably guided in the chambers 50 of the boxes 48. Both boxes 48 are provided with partitions 52 to divide each box into one chamber 50 and a chamber 54. The grooved pulleys 26 are housed in the chambers 24, and the box 44 is provided with openings 56 for accommodating the vertical runs of the two cables 28, best illustrated in Figure 1. Each box 48 is provided with a slot 56 for accommodating the shafts 24 so that the shafts may move freely vertically in the slots.

A weather sealing flange 58 is fixed to each

box 48 adjacent the slot 56 therein, which flanges are arranged vertically and lie in parallelism with the door sections 12 and 14 in the closed position of the door. Sealing flanges 60 and 62 are fixed to both door sections 12 and 14 for sealing engagement with their respective flanges 58. The flanges 60 and 62 are offset laterally with respect to each other so that the flange 60 engages one face of the flange 58 and the flange 62 engages the other face when their respective door section is in its closed position. The flanges 60 and 62 are spaced, as at 64, so that the door sections 12 and 14 may pivot about the axes of the shafts 24, as when the door sections are moved to their fully opened position of Figure 3. When the door sections 12 and 14 are in the position of Figure 2, the flanges 60 and 62 lie snugly against their respective flanges 58 to provide a weather seal.

While the flanges 60 and 62 are spaced, means are provided for closing the spaces when the door sections are dropped down. In Figures 8 through 11, I illustrate one such means. Since all the units are of identical construction, the description of one will apply to all. Upon the shaft 24 is mounted an angle 66 having a flange 68 bearing against the bight 70 of the bracket 20. A compression spring 72 is interposed between the flange 68 and a washer 74 mounted on the shaft 24 and held in place by a pin 76. Thus the angle 66 is yieldingly pressed against the bight 70.

A curved rib 78 is fixed to the bight 70 and extends in parallelism with the door section 14. The flange 80 of the angle 66 lies flatwise against the flange 58, and a flange 82 is fixed to the angle 66 and lies flatwise against the opposite face of the flange 58. Thus the angle 66 is restrained from rotation, but the angle slides freely relatively to the flange 58. When the door section 14 is in the closed position of Figure 10, the rib 78 lies in a correspondingly shaped depression 84 in the flange 66, which yieldingly latches the door section 14 in its closed position. However, the rib 78 cams from the depression 84 as the door section 14 is turned about the axis of the shaft 24.

The flange 80 is of such vertical dimension as to span the space 64 when the section 14 is swung closed to provide a sealing bridge. Figure 13 illustrates the manner in which the flange 80 engages the flange 58. The flange 60 is provided with an offset 86 which is engaged by the flange 80 as the door section is swung closed.

The flanges 80 and 82 restrain the angle 66 from rotation when its door section is being opened or closed, the flange 68 being loosely mounted on the shaft 24. At the same time, the flanges 80 and 82 guide the shaft 24 vertically and restrain the shaft from lateral movement, so that the shaft remains centered in its respective slot 56.

In Figures 2 and 3, a bracket 88 is fixed at 90 to the box 44. A link 92 has one end pivotally connected with the bracket 88, and its other end pivotally connected with one end of a bowed link 94 having its other end pivotally connected at 96 with the inner top edge margin of the door section 14. Two such link devices are provided for the section 14.

In operation, the door 10 is so counterbalanced as to be easily movable upwardly or downwardly. To open the door, a push is exerted on the inner side of the door in the vicinity of the hinges 13. This causes the sections 12 and 14 to pivot outwardly about the axes of the hinges. Since the brackets 88 are fixed to the box 44 any relative pivotal movement of the sections 12 and 14 in an outward direction causes the sections 12 and 14 to elevate, since the upper edge of the section 14 is restrained from downward movement.

The door is so counterbalanced as to require little effort in sliding the sections 12 and 14 upwardly to their open positions of Figure 3. The chambers 50 and 54 isolate the weights 38 from the grooved pulleys 26 on the door sections 12 and 14 to eliminate interference between the relatively movable weights and pulleys, as well as the vertical runs of the cable 28. The supports 30 of Figure 16 constitute one wall of the box 48, see Figure 5. The vertical runs of the cables 28 are sufficiently spread to prevent coiling of the vertical runs about one another.

Any opening or closing movement of the door sections 12 and 14 is characterized by rotation of the sections about the axes of their respective shafts 24. These shafts are located on the horizontal medial lines of the respective sections so that the sections are balanced. The cables 26 are so guided and related to their respective pulleys and weights as to cause the door section 12 to move simultaneously with the door section 12 but throughout a considerably greater distance with respect to the shafts 24 in relation to the boxes 48. The arrangement is such that the hingedly connected edges of the sections 12 and 14 move simultaneously at equal distances, but the shafts 24 on the section 12 are caused to travel vertically throughout distances considerably greater than the shafts 24 on the section 14.

The grooved pulleys 36 attached to the weights 38 are partly housed in recesses 98 in their respective weights. This provides a closely nested arrangement. The sections 12 and 14 are provided with vertical brace members 100 and horizontal rods 102 for pressing the members 100 against the inner faces of their respective door sections. The rods 102 extend through brackets 104 attached to the respective door sections 12 and 14, and the rods are provided with nuts 106 so that the rods may be drawn tightly against the members 100.

Without further elaboration, the foregoing will so fully explain my invention, that others may, by applying current knowledge, readily adapt the same for use under various conditions of service.

I claim:

1. A closure comprising two vertical guide means spaced to provide a door opening, a door comprising two sections arranged one above the other in the closed position of the door and hingedly connected together along their adjacent margins, a horizontal shaft means carried by each section intermediate its upper and lower limits, pulleys on the respective shaft means, guides loosely mounted on said shaft means and guidingly engaging the respective guide means, door counterbalancing means having lines passing around said pulleys, and means connected with the top margin of the upper door section to restrain the door sections from downward movement when the two sections are folded back upon each other.

2. A closure for a supporting structure defining a door opening and having two horizontally spaced vertical guides, comprising a door formed with a lower section and an upper section hingedly connected together to fold back upon each other, horizontal shaft means carried by the respective upper and lower sections intermediate their upper and lower limits, pulleys on the respective shaft means and on said supporting structure, second guides loosely mounted on said shaft means and

guidingly engaging the vertical guides, a door counterbalancing means comprising weights having lines passing around said pulleys and attached to said supporting structure, and link means connected with said supporting structure and said upper section to restrain the door sections from downward movement when the two sections are folded back upon each other.

3. The invention described in claim 2 wherein two weights are provided, each weight being suspended from one line, and each line having both ends attached to said supporting structure and passing around one pulley of the lower section and one pulley of the upper section.

4. The invention described in claim 2 wherein said vertical guides are in the nature of flanges attached to said supporting structure, and in which said sections are provided with flanges respectively engaging outer and inner faces of the respective first mentioned flanges in the closed position of the door.

5. The invention described in claim 2 wherein the upper and lower sections are respectively provided with sealing flanges engaging outer and inner faces of said vertical guides in the closed position of the door.

6. The invention described in claim 2 wherein said sections and said second guides are provided with coacting latch means to yieldingly latch the sections against relative pivotal movement when the door is in its closed position.

7. The invention described in claim 2 wherein said supporting structure is provided with chambers for housing the pulleys attached to said sections, said chambers having slots providing clearance for said shaft means.

8. The invention described in claim 2 wherein said counterbalancing means includes weights suspended from the respective lines, said supporting structure having first chambers housing said weights and second chambers housing the pulleys attached to said upper and lower sections and the lines passing about the pulleys on the horizontal shaft means, said second chambers being provided with vertical slots providing clearance for said horizontal shaft means.

9. The invention described in claim 1 wherein said guides and said door sections are provided with coacting latch means to yieldingly latch the sections against relative movement in the closed position of the door.

10. The invention described in claim 2 wherein said upper and lower sections are provided with flanges sealingly engaging said vertical guides in the closed position of the door, each section having two flanges engaging the outer faces of the respective vertical guides and two flanges engaging the inner faces of the respective vertical guides and spaced from said first mentioned flanges, said second guides constituting closures for the spaces between the flanges in the closed position of the door.

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