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W. G. HORSTMAN
DOOR CONSTRUCTION

2,203,264

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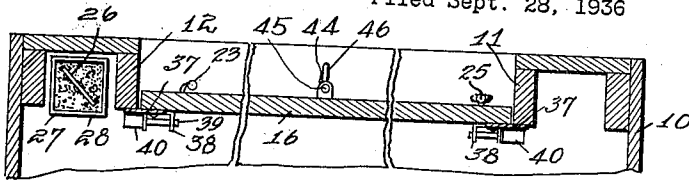


Fig. 3.

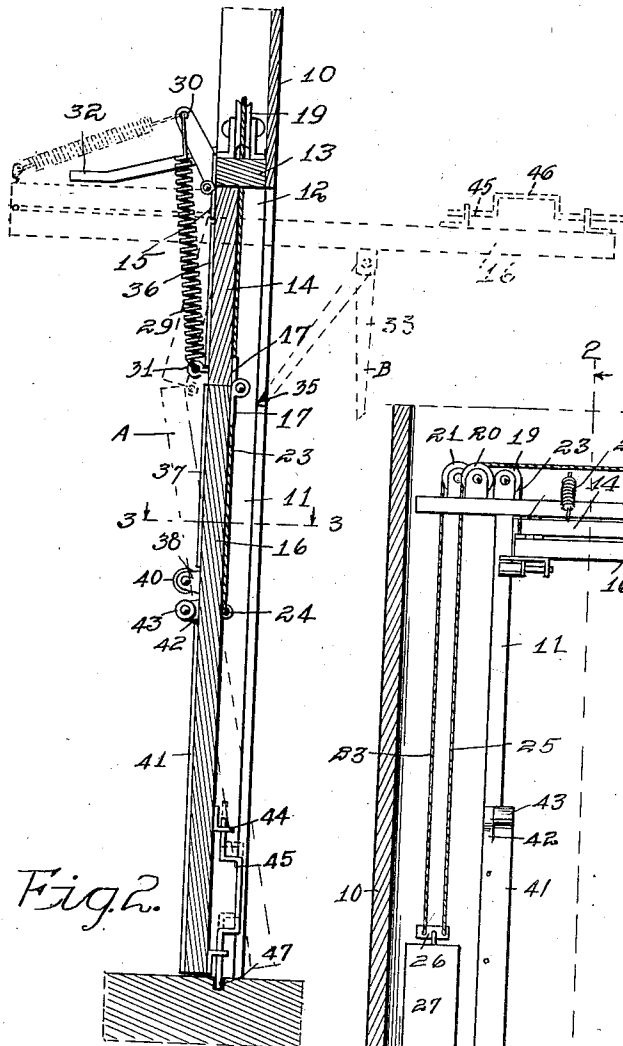


Fig. 2.

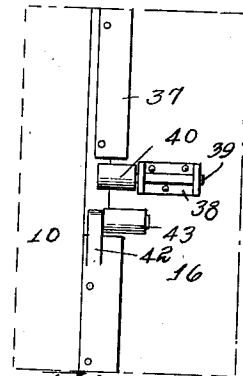


Fig. 4.

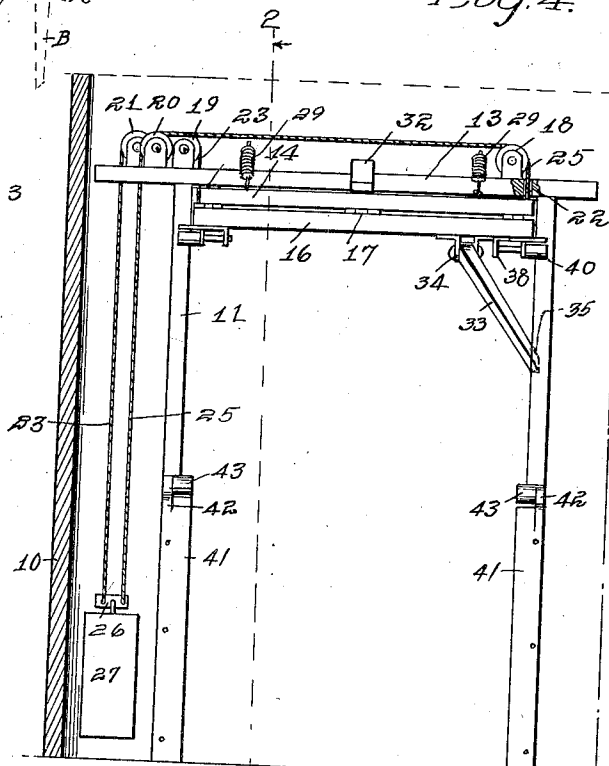


Fig. 1.

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DOOR CONSTRUCTION

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6 Claims. (Cl. 20—20)

This invention relates to an improved door construction and particularly that type of door comprising a series of hinged door sections hinged to the top edge of the door frame in such a manner that the sections may be lifted or elevated to folded overlapping positions adjacent to the upper surface of the door frame in which the door is mounted.

I am aware that a number of doors have been constructed of sections adapted to fold in the manner above described. However, most or all of these doors, insofar as I am aware, are provided with vertically arranged channels or guide devices mounted on the sides of the door frame to co-operate with rollers or other suitable guiding means carried by the door sections, so as to cause the door sections to be folded in a predetermined manner. These guide devices are objectionable on the grounds that the door frames sometimes sag and get out of alignment causing a certain amount of binding between the the door sections and the guides, resulting in difficulty in causing the sections to fold properly. Furthermore, this adds considerably to the expense of the door construction. It is, therefore, one of the objects of my invention to provide a simple, durable and inexpensive door construction formed preferably of two hinged sections and so constructed and arranged that the above mentioned guide devices may be entirely eliminated.

A further object of my invention is to provide in a door construction of the type above described, improved means for moving the door sections from their closed vertical positions to their open and horizontal folded positions, and for controlling the oscillation of the door sections as they are moved to said folded position, without the use of expensive guides or tracks.

A further object of my invention is to provide in a folded door construction of the type above described in which the guides and tracks are eliminated, improved means for sealing the vertical joints between the side edges of the door and the adjacent door frames when the door sections are closed.

A further object is to provide improved means for locking or holding the door in its folded and open position to steady the same against oscillation due to heavy winds.

A further object is to provide in a door construction of the type above described, improved means to assist in moving the door sections to their closed positions and for locking them in said closed positions.

My invention consists in the construction, arrangement and combination of the various parts of the device whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawing, in which:

Figure 1 is an inside view of a building, such as a garage, illustrating the manner in which my improved door construction is mounted therein, the door being supported in its open position.

Figure 2 is a detail vertical sectional view of the same taken on the line 2—2 of Figure 1, with the doors in their closed positions, the doors also being shown in dotted lines in their open positions, and in dotted lines in partially open positions.

Figure 3 is a detail sectional view taken on the line 3—3 of Figure 2.

Figure 4 is an enlarged detail view illustrating the stop and guide rollers used in connection with the opening and closing operations of the door.

In the drawing I have used the reference numeral 10 to indicate a building frame, such as a garage, having in one end a door frame 11 comprising side members 12 and a top member 13. Hinged beneath the inner edge of the frame member 13 is a door section 14, by means of suitable hinges 15, and hinged to the lower edge of the door section 14 is a door section 16, by means of hinges 17, the hinges 17 being mounted on the outer faces of the said door sections, as clearly illustrated in Figure 2. The upper door section 14 is substantially one-third the height of the door section 16, so that the door sections may be swung to closed positions, as illustrated in dotted lines in Figure 2, with two-thirds of the lower edge of the door section 16 extending outwardly and laterally from the front face of the building 10, with the upper end of the door section 16 and the door section 14 projecting inwardly, the weight of the inwardly extending sections being substantially equal to the weight of the outwardly extending section, the side edges of the door sections 14 and 16 being adapted to move freely from a closed position to any open position, and vice versa.

For counter-balancing the weight of the doors as they are moved to said closed positions, I have provided on the top surface of the members 13, pulleys 18, 19, 20 and 21, and through the frame member 13, openings 22, one of the openings 22 being adapted to receive a flexible cable 25 passing over the pulleys 18 and 20 and having one

end connected to the door member 16 by means of a suitable staple 24. A similar cable 23 is mounted through the other opening 22 and connected to another staple 24 in the door 16, said cable 23 extending over pulleys 19 and 21, said cables 23 and 25 having their opposite ends connected to a bar 26, which in turn is connected to a box 27, having its sides and bottom closed and its top open to receive suitable ballast 28, such as stones or sand, a sufficient amount of the ballast being applied to give the desired counter-balancing effect.

The staples 24 are located in the outer face of the door section 16 substantially one-third of the distance from its upper edge to its lower edge, said cables extending upwardly along the outer face of the door sections, as clearly indicated in Figure 2.

Due to the fact that the hinge members are connected with the inner faces of the door section 14 and the hinge members 17 are mounted on the outer faces of the door sections, strains applied to the cables 23 and 25 in an upwardly direction tend slightly to move the door sections to the dotted line position A, as illustrated in Figure 2.

To further assist in accomplishing this initial opening movement I have provided springs 29 having their upper ends connected to brackets 30 carried by the member 13, and the lower ends connected to pivots 31 carried by the inner face of the lower edge of the door section 14, the upper ends of the brackets 30 being a considerable distance above the pivots of the hinges 15, so as to maintain a constant pressure between the door section 14 and the inwardly extending stop 32 when the door sections are in their open positions, thereby providing a certain amount of stabilizing effect to prevent free oscillation of the door sections by wind currents, the stop 32 being secured to the upper face of the member 13.

For locking the outer end of the door section 16 in its folded position I have provided a bar 33 pivoted to said door section by means of a bracket 34, said bar being adapted to swing downwardly against the inner face of the door section when the door is in its closed position, and to be moved to an inwardly inclined position with its free end in a notch 35 in the door frame, as illustrated in dotted lines in Figure 2. It will readily be seen that as the door is moved to its closed position the member 33 will maintain a vertical position, as illustrated in dotted lines B, Figure 2, thus providing a handle which may be easily grasped by the operator so as to force the door to its closed position, if necessary.

The side edges of the inner face of the door section 14 are provided with weather strips 36 designed to overlap the frame members 12 when the door sections are in their closed position. The upper half of the door section 16 is also provided with similar weather strips 37, having at the lower ends brackets 38 for supporting a rod 39, the outer ends of which are provided with rollers 40 designed to travel adjacent to the inner edge of the door frames 12 to prevent outwardly swinging movement of the door sections as they are moved from the dotted line position A to their folded position.

The inner edges of the frame members 12 are provided with weather strips 41, adapted to overlap the inner face of the lower end of the door section 16. These members 41 are permanently fixed in position and serve as stops to limit the inward movement of the lower end of the door

sections. The upper end of each of the strips 41 is provided with a bracket 42 on which a roller 43 is mounted, the rollers 43 serving as fulcrum devices as the door sections are moved to their closed position after they have reached the dotted line position A. The doors may then be forced to a closed position by applying the operator's foot to the lower edge of the door section 16, and then forcing the lower edge of said door inwardly to the solid line position, as illustrated in Figure 2. The door may then be locked by means of a latch comprising a pair of brackets 44 and a rod 45, said rod having an outwardly bent portion 46 to form a handle for raising and lowering the rod member into and out of a socket 47 formed in the floor of the building or the door frame. This portion 46 serves as a handle to assist in opening the door after it has been unlocked.

Thus it will be seen I have provided a door of simple, durable and inexpensive construction having improved means for counter-balancing the weight of the door in which both of the cables 24 and 25 are connected to the opposite side edges of the door and to a single bar 26 supporting a common weight 27. By this arrangement the same elevating power will be applied to both edges of the door sections. In case the operator should grasp one edge of the door section after it has been partially opened, to assist in the opening movement of the door, then it will be seen that additional lifting force from the box 27 will be applied to the opposite side of the door section in an amount equal to the lifting force applied by the operator, so that at all times an equal lifting force is applied to both sides of the door sections so as to overcome any binding tendency that would be encountered if separate counter-balancing weights were applied to each side of the door sections, in which latter case no additional lifting effect would be produced by the weights on the opposite side of the door from which the operator was applying the lifting force.

By the use of the rollers 40 I have provided means for preventing any excessive oscillations of the door sections due to air currents at the time the door sections are being moved to and from their closed positions, and for this reason it will be seen I have provided a door of very simple construction in which a very limited number of hinges are necessary and in which all vertical guide channels or similar track devices are eliminated, and which is particularly adapted to be used in connection with garage door openings.

I claim as my invention:

1. The combination of a door frame, upper and lower door sections within said frame, means hinging the upper section to said frame and the lower section to the upper section, said sections being adapted to swing from a vertical position to horizontal overlapping positions, a single counter balancing means, means operatively connecting said counter-balancing means to each end of said door section; to fold said sections simultaneously, fulcrum means carried by the central portion of the side edges of the lower door section to travel adjacent to the side members of the door frame to act as fulcrum devices in the preliminary opening movement of the door sections and to act as stops to limit the free oscillation of the door sections in one direction as the sections are moved to their folded positions.

2. The combination of a door frame, upper and lower door sections within said frame, means hinging the upper section to said frame and the lower section to the upper section, said sections

being adapted to swing from a vertical position to horizontal overlapping positions, counter-balancing means tending to fold said door sections, simultaneously, means carried by the central portions of the side edges of the door sections to travel adjacent to the side members of the door frame to act as fulcrum devices in the preliminary opening movement of the door sections, and a second fulcrum device carried by the door frame supported immediately below the first fulcrum device when the doors are in closed position.

3. The combination of a door frame, upper and lower door sections within said frame, means hinging the upper section to said frame and the lower section to the upper section, the upper section being substantially one-third of the height of the lower section, said sections being adapted to swing freely between the upright members of said door frame from a vertical position to horizontally overlapping positions, counter-balancing means tending to fold said door sections, including flexible cables and sheaves, said cables having one set of corresponding ends attached to a weight and each of the other ends attached to opposite sides of the lower door section and intermediate its upper and lower edges whereby the weight will tend to counter-balance the weight of the door sections as they are moved to open and closed positions, and whereby the inner and outer ends of the door sections, when in a folded position, will be substantially balanced about the points of attachment of the door sections with said cables, for the purpose stated.

4. The combination of a door frame, upper and lower door sections within said frame, means hinging the upper section to the upper side of the frame and the lower section to the upper section to swing freely between the vertical members of said frame, fixed fulcrum devices carried by the door frame to be engaged by the lower door section as the door sections are moved to

nearly closed positions, and counter-balancing means tending to move the door sections to overlapping and horizontal positions whereby the door sections may be moved freely to open and closed positions without frictionally engaging guide devices or the door frame.

5. The combination of a door frame, upper and lower door sections within said frame, means hinging the upper section to said frame and the lower section to the upper section, the upper section being substantially one-third of the height of the lower section, said sections being adapted to swing freely between the upright members of said door frame and from a vertical position to horizontally overlapping positions, counter-balancing means tending to fold said door sections, including flexible cables attached to opposite sides of the lower door section and intermediate its upper and lower edges whereby the weight will tend to counter-balance the weight of the door sections as they are moved to open and closed positions, and whereby the inner and outer ends of the door sections, when in a folded position, will be substantially balanced about the points of attachment of the door sections with said cables for the purpose stated.

6. The combination of a door frame, upper and lower door sections within said frame, means hinging the upper section to said frame and the lower section to the upper section to swing freely between the vertical members of the door frame, said sections being adapted to swing from a vertical position to horizontal overlapping positions, counter-balancing means tending to fold said door sections simultaneously, and means carried by the central portions of the side edges of the lower section to travel adjacent to one edge of the side members of the door frame to prevent outward swinging movement of the door sections as they are moved to their closed position.

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